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COMMITTEE ON THE PEACEFUL
USES OF OUTER SPACE

COORDINATION OF OUTER SPACE ACTIVITIES WITHIN THE UNITED NATIONS SYSTEM: PROGRAMME OF WORK FOR 1996 AND 1997 AND FUTURE YEARS

Report of the Secretary-General

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EXPLANATORY NOTES

Secretariat units, bodies and specialized agencies

ECE	Economic Commission for Europe
ESCAP	Economic and Social Commission for Asia and the Pacific
ECLAC	Economic Commission for Latin America and the Caribbean
ECA	Economic Commission for Africa
ESCWA	Economic and Social Commission for Western Asia
UNEP	United Nations Environment Programme
UNDCP	United Nations International Drug Control Programme
UNDP	United Nations Development Programme
UNITAR	United Nations Institute for Training and Research
WFP	World Food Programme
ILO	International Labour Organization
FAO	Food and Agriculture Organization of the United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
ICAO	International Civil Aviation Organization
WHO	World Health Organization
ITU	International Telecommunication Union
WMO	World Meteorological Organization
IMO	International Maritime Organization
WIPO	World Intellectual Property Organization
IFAD	International Fund for Agricultural Development
UNIDO	United Nations Industrial Development Organization
IAEA	International Atomic Energy Agency

Other acronyms and abbreviations

ACSYS	Arctic Climate System Study (WCRP)
AEPS	Arctic Environment Protection Strategy
AFRICOVER	Africa Land Cover Map and Digital Geographic Database
AGRHYMET	Agrometeorology and Operational Hydrology and Their Applications
AIT	Asian Institute of Technology
AMAP	Arctic Monitoring and Assessment Program
ARTEMIS	African Real-Time Environmental Monitoring using Imaging Satellites
ASEAN	Association of South-East Asian Nations
AVHRR	advanced very high resolution radiometer
BDT	Telecommunications Development Bureau (ITU)
CAF	Corporación Andina de Fomento
CAFF	Conservation of Arctic Flora and Fauna Programme
CEOS	Committee on Earth Observation Satellites
CILSS	Permanent Inter-State Committee for Drought Control in the Sahel
CNES	Centre national d'études spatiales (France)
CNS/ATM	communications, navigation and surveillance and air traffic management
COMEMIS	Coastal and Marine Environment Management Information System
COPINE	Cooperative Information Network Linking Scientists, Educators and Professionals in Africa
COSPAR	Committee on Space Research
COSPAS-SARSAT	International Search and Rescue Satellite System
CRTEAN	Centre régional de télédétection des états de l'Afrique de Nord

CRTO	Ouagadougou Regional Remote Sensing Centre
DARA	German Space Agency
DIANA	Direct Information Access Network for Africa (FAO)
DSE	German Foundation for International Development
EAP	Environment Assessment Programme (UNEP)
ECZ	Environmental Council of Zambia
EIS	environmental information system
ELMS	Environment and Land Management Sector
EMPRES	Emergency Prevention System (FAO)
ENRIN	Environment and Natural Resource Information Networks (UNEP)
EPIRB	emergency position-indicating radiobeacon
ERS	European remote sensing satellite
ESA	European Space Agency
ESINAP	Earth space information network for Asia and the Pacific
EURISY	European Association for the International Space Year
FINNIDA	Finnish International Development Agency
FRA	Forest Resources Assessment (FAO)
GARS	Geological Applications of Remote Sensing
GAW	Global Atmosphere Watch (WMO)
GCIP	GEWEX Continental-scale International Project (WCRP)
GCOS	Global Climate Observing System (UNEP/IOC/WMO)
GEMS	Global Environment Monitoring System
GEWEX	Global Energy and Water Cycle Experiment (WCRP)
GIEWS	Global Information and Early Warning System on Food and Agriculture (FAO)
GIS	Geographic Information System
GISNH	Global Information Systems on Natural Hazards
GLONASS	Global Orbiting Navigation Satellite System (Russian Federation)
GMDSS	Global Maritime Distress and Safety System
GNSS	Global Navigation Satellite System
GOOS	Global Ocean Observing System (IOC)
GPS	Global Positioning System
GRID	Global Resource Information Database (UNEP)
GTOS	Global Terrestrial Observing System
IAF	International Astronautical Federation
ICSU	International Council of Scientific Unions
IEIS	Integrated Environmental Information System
IGADD	Intergovernmental Authority on Drought and Development
IGN-FI	Institut géographique national - France international
INFOCLIMA	World Climate Data Information Referral System (WMO)
INFOTERRA	International Environment Information System (UNEP)
Inmarsat	International Mobile Satellite Organization
INPA	National Institute for Research in the Amazon (Brazil)
INTELSAT	International Telecommunication Satellite Organization
IOC	Intergovernmental Oceanographic Commission (UNESCO)
IOMAC	Organisation for Indian Ocean Marine Affairs Co-operation
ISPRS	International Society for Photogrammetry and Remote Sensing
ITC	International Institute for Aerospace Survey and Earth Sciences
IUFRO	International Union of Forestry Research Organisations
JUNAC	Board of the Cartagena Agreement
LANDSAT	Land Remote Sensing Satellite
LIS	land information system

NASA	National Aeronautics and Space Administration (United States of America)
NASDA	National Space Development Agency (Japan)
NLR	National Aerospace Laboratory (Netherlands)
NOAA	National Oceanic and Atmospheric Administration (United States of America)
NOWPAP	NW Pacific Action Plan
OLIVIA	Operational Low-Cost Integrated Vital Information Access (FAO)
ORSTOM	Institut français de recherche scientifique pour le développement et coopération
PAC	Programme Activity Centre (UNEP)
PAME	Protection of the Arctic Marine Environment
PANAFTEL	Pan-African Telecommunications Network
RAMSES	Reconnaissance and Management System of the Environment of Scmistocera (FAO)
RASCOM	Regional African Satellite Communications System
RCSSMRS	Regional Centre for Services in Surveying, Mapping and Remote Sensing (ECA)
RECTAS	Regional Centre for Training in Aerospace Surveys (ECA)
RESPAS	Remote Sensing Processing and Archiving System for Forest Assessment and Monitoring (FAO)
ROSELT	long-term ecological observatory network
SADC	Southern African Development Community
SOTER	Soils and Terrain (UNEP)
SPACECOM	Space Communications Technology Applications (ITU)
SPOT	Satellite pour l'observation de la Terre (France)
TELECOM	World Telecommunication Exhibition and Forum
TREES	Tropical Ecosystem Environment Observations by Satellite
USAID	United States Agency for International Development
WAFS	World Area Forecast System
WCASP	World Climate Applications and Services Programme (WMO)
WCMC	World Conservation Monitoring Centre
WCRP	World Climate Research Programme (WMO/ICSU/IOC)
WHYCOS	World Hydrological Cycle Observing System (WMO/World Bank)
WOCE	World Ocean Circulation Experiment (WCRP)
WRI	World Resources Institute

INTRODUCTION

1. The present report has been prepared by the Secretary-General at the request of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space and concerns efforts at coordinating the activities of organizations within the United Nations system that relate to assistance to developing countries in the practical applications of space technology.

2. The report is based on the contributions submitted by the organizations concerned in response to the United Nations request for information on concrete programmes of work envisaged primarily for 1996 and 1997, and was reviewed in its draft form at the Inter-Agency Meeting on Outer Space Activities, held at Vienna from 7 to 9 February 1996.

3. The report consists of three sections. Section I contains a list of the participants in outer space activities within the United Nations system. A matrix of outer space programmes is also provided to identify the activities of each participant in specific fields. Section II presents a summary of major activities and programmes planned for 1996 and 1997 and future years by the organizations within the United Nations system as a whole. Section III presents concrete activities or programmes planned by individual organizations in an integrated form under subsections on remote sensing and the Geographic Information System (GIS), communications and navigation, meteorology and hydrology, basic space science, safety aspects, and other activities in the field of space science and technology and its applications.

4. There are three headings - education and training programmes, expert services and survey missions, and dissemination or exchange of information - under each of the first three subsections in section III (remote sensing and GIS, communications and navigation, and meteorology and hydrology). Concerning the last of those headings, more efforts are being made within the United Nations system to develop databases to disseminate information with increased accuracy, quantity and speed. In the present report, activities related to the establishment or development of databases are categorized as studies on or implementation of pilot projects while those related to the operation of databases, after the development phase is completed, are categorized as dissemination or exchange of information.

5. Valuable information on space technology or on operational systems can also be disseminated at meetings or conferences where decision makers in space activities exchange their opinions and may elaborate strategies or plans for future activities. Since the main purpose of such meetings or conferences is not to educate or train, they are also categorized as dissemination or exchange of information, rather than education and training programmes.

6. Under the subsection on remote sensing and GIS, there are two more headings, "Establishment of centres for space science and technology education" and "Capacity building", reflecting the increase in efforts to develop indigenous capability in space science and technology in developing countries.

7. Under the subsection on activities in the field of communications and navigation, there are two additional headings relating to the efforts in the United Nations system concerning legal aspects. One concerns the regulation of the use of the geostationary satellite orbit and the radio-frequency spectrum allocated to space communication services. The other heading concerns the efforts towards the establishment of new legal frameworks or the development of new technological systems to complement the existing legal frameworks.

I. PARTICIPANTS IN OUTER SPACE ACTIVITIES WITHIN THE UNITED NATIONS SYSTEM AND MATRIX OF OUTER SPACE PROGRAMMES

8. The participants in outer space activities within the United Nations system included the following Secretariat units, bodies, research institutes, specialized agencies and other organizations: Office for Outer Space Affairs, Department for Development Support and Management Services, Department of Humanitarian Affairs, Economic Commission for Europe (ECE), Economic and Social Commission for Asia and the Pacific (ESCAP), Economic Commission for Africa (ECA), United Nations Environment Programme (UNEP), United Nations Development Programme (UNDP), United Nations Institute for Training and Research (UNITAR), Food and Agriculture Organization of the United Nations (FAO), United Nations Educational, Scientific and Cultural Organization (UNESCO), International Civil Aviation Organization (ICAO), World Health Organization (WHO), World Bank, International Telecommunication Union (ITU), World Meteorological Organization (WMO), International Maritime Organization (IMO), World Intellectual Property Organization (WIPO), United Nations Industrial Development Organization (UNIDO) and International Atomic Energy Agency (IAEA).

9. A matrix of outer space programmes within the United Nations system is presented below.

II. SUMMARY OF MAJOR ACTIVITIES AND PROGRAMMES PLANNED FOR 1996 AND 1997 AND FUTURE YEARS

10. Organizations within the United Nations system have planned activities for 1996 and 1997 and future years within the fields of remote sensing and GIS, communications and navigation, meteorology and hydrology. Valuable space-related or space-aided activities in basic space sciences, improvement of safety and other activities related to space science and technology and its applications will also be conducted by organizations within the United Nations system.

11. The planned activities range from education and training to operational applications of technologies. Three categories of activities are notable in most of the above-mentioned fields of space activities. The first category to be noted is the education and training programmes, which are generally offered by holding training courses, workshops and seminars or supporting fellowships. Efforts are being made to improve the educational and training environment by establishing new facilities or providing educational tools.

12. Secondly, organizations within the United Nations system provide expert services and conduct survey missions to identify specific areas of applications relevant to a given country or group of countries. Specific studies on pilot projects in a country or group of countries are also being conducted. In recent years, there has been increasing emphasis on maximizing the benefits from space activities for social and economic development through the operational applications of existing space technologies. A number of projects with such emphasis are carried out at the local, regional or global level.

13. Thirdly, dissemination of information on the status of technology or on the operational systems has always been an important element in space activities. Organizations within the United Nations system issue numerous recurrent or non-recurrent publications on emerging new space technologies. The publications also contain suggestions on possible applications of those technologies. More information is being distributed through computer networks, which in turn stimulates demand for the further development of databases. The use of Internet and its various services, including electronic mail, File Transfer Protocol, name lists and the World Wide Web, is considered a very appropriate means of improving coordination among the organizations of the United Nations system, and efforts are being made to further expand the use of Internet for such purposes.

Participants in outer space activities and matrix of outer space programmes[a/]

United Nations entity	*Remote sensing*	*Communications and navigation*	*Meteorology and hydrology*	*Basic space science*	*Safety aspects*	*Other applications*
OOSA[b/]	29,35,41-43,57, 113,114,135-137	160,161,164	195,198	234-237		246-250
DDSMS[c/]	42,44,45,139					
DHA[d/]	59-61,76		215			
UNDCP	57,58,93					
UNEP	61-78,91,115-122, 140-144,152(a)(iii)	165,166,174,175	199-201,204-207, 210-212,217,224-226			
ECA	30,36,45,46,49,79,80, 98,123,130-132,138	166				
ECE	45,49,127					
ECLAC	45,49					
ESCAP	31,37,39,45,47,49,67, 81,99,124-126,133, 142(c),145,146	167	192			251
ESCWA	45					
UNDP	31,140,141(f), 142(h)(j),147(c),148(c)		197,214			
UNITAR	140,141(b),151-156					
FAO	32,38,40,48-55,57,58, 69,80,82-103,107,128, 140,147-150	166,168	193,202,203,205, 208-211		243	
UNESCO	33,34,56,68,91, 104-112,129,134	162,169,170,180, 181	191,196,205, 210-212,216,217, 224,225,227,228, 230,231			
UNIDO						252-253
ICAO		157,182,183, 187-190	233			
WHO	143				243	
ITU		158,159,163,170, 171,172, 176-179,181	191(c),213		238-240, 242	
WMO	140		194,197,201,205,210, 214-225,229-233		242	
IMO		186,187,190			240-242	
WIPO		173,184,185				254
World Bank			214(a),223			
IAEA					243-245	

[a/]The numbers in each column indicate the relevant paragraphs in the present report.
[b/]Office for Outer Space Affairs of the Secretariat.
[c/]Department for Development Support and Management Services.
[d/]Department of Humanitarian Affairs of the Secretariat.

14. In the field of remote sensing, the United Nations and its specialized agencies have planned a number of international, regional and national training courses and workshops. They cover remote sensing applications in general as well as specialized topics such as sustainable development of natural resources and energy, natural resources and environment management, land-cover mapping and land-use planning. Most of these international and regional training courses are jointly organized by two or more organizations within the United Nations system, often in cooperation with other international organizations and/or Governments.

15. Many of the organizations of the United Nations system offer expert services in their respective areas of competence and carry out pilot projects with the use of remote sensing technologies and GIS. These technologies are applied to a wide range of activities, such as natural resources and environment monitoring, management and development, monitoring of natural resources and natural disasters, early warning for food security, land-cover mapping and land management, forest planning and management, mapping of desertification, monitoring of cultural sites and pest disease control. A number of projects by the organizations of the United Nations system are aimed at establishing databases or information networks at the regional or global level, such as Africa Land Cover Map and Digital Geographic Database (AFRICOVER), African Real-Time Environmental Monitoring using Imaging Satellites (ARTEMIS), Operational Low-Cost Integrated Vital Information Access (OLIVIA) programme, Geological Applications of Remote Sensing (GARS) programme, Global Environment Monitoring System (GEMS) and Global Resource Information Database (GRID) projects, to list a few.

16. In the area of dissemination of information, organizations either provide information upon request or issue recurrent or non-recurrent publications concerning technological status or existing operational systems to increase awareness of the useful applications of remote sensing technologies. Reflecting the rapid expansion of the information superhighway with the use of computer networks, an increasing number of organizations are establishing databases that will tremendously increase the availability of data of interest for a larger number of computer users. It should be noted that meetings of experts or decision makers and workshops organized within the United Nations system also provide opportunities to exchange updated technological or policy-related information that is vital in elaborating regional or global strategies for social and economic development with the use of remote sensing technologies.

17. Further progress has been made towards the establishment of regional centres for space science and technology education with the cooperation of the Secretariat, regional commissions and other interested organizations within the United Nations system, after the completion of evaluation missions to Africa, Asia and the Pacific, Latin America and the Caribbean, and West Asia. The centres for space science and technology education in Asia and the Pacific and in Latin America and the Caribbean are expected to become operational in the period 1996-1997.

18. There will be more activities within the United Nations system with the particular objective of capacity building in developing countries with the use of remote sensing and GIS technologies. Most of the efforts are directed towards the strengthening of operational capability of existing regional or national institutions involved in environmental management for sustainable development, natural resource monitoring or land-cover mapping. Especially within the framework of field projects, the development of human resources is considered an important factor.

19. In the field of communications and navigation, efforts are being made to organize a training course and workshops and to provide fellowship support. As far as expert and technical advisory services are concerned, organizations within the United Nations system participate in the development of domestic or regional satellite communication systems for various purposes such as improving distance education, increasing public awareness in environmental protection and supplementing early warning systems for food security. Satellite communication systems are also considered a vital tool for social and economic development, as demonstrated by the Regional African Satellite Communications System (RASCOM) project. Satellite communication systems are also used to improve communications between the headquarters and the regional offices, or

among the regional offices, of the organizations, as demonstrated by the Mercure satellite telecommunications system.

20. The results or interim reports of the projects or studies conducted within the United Nations system are also available in the form of recurrent or non-recurrent publications or digitized data disseminated through computer networks.

21. Various studies are being carried out to examine the technical constraints associated with radio-frequency allocations and related provisions for space radiocommunications below 3 GHz with a view to facilitating the use of those frequency bands. Efforts are also being made towards the establishment of new legal norms or the development of new technological systems to complement the existing legal framework. Examples of such efforts are the enforcement of intellectual property rights, including copyright, and the development of a new system in the interest of international civil aviation.

22. The work of the specialized agencies of the United Nations is also making significant contributions in the area of applications of space technology for land, maritime and aeronautical mobile communications. Studies on a worldwide radio-navigation system are being conducted within the United Nations system. While the Global Positioning System (GPS) and the Global Orbiting Navigation Satellite System (GLONASS) are regarded as candidates, consideration is also being given to a post-GPS/GLONASS system.

23. The application of satellite technology forms an important element of technical cooperation activities in both meteorology and operational hydrology. A series of workshops, training courses and fellowship programmes are planned for 1996 and 1997 to discuss the subjects of satellite meteorology, tropical meteorology, hurricane forecasting, marine studies and watershed management, among many others.

24. Through the provision of expert services, efforts are made to develop a marine and coastal zone data information system, to improve management of water and coastal resources, to upgrade meteorological observations by installing data collection platforms and to improve the meteorological telecommunication system by planning the implementation of a regional meteorological telecommunication network in various regions. Reflecting the increasing awareness of global changes, including climate change, organizations within the United Nations system also cooperate in global schemes, such as the Global Climate Observing System (GCOS), Global Terrestrial Observing System (GTOS), Global Ocean Observing System (GOOS), Global Atmosphere Watch (GAW), World Climate Research Programme (WCRP) and World Climate Data and Monitoring Programme. A series of technical reports on climate research and ocean observations, as well as water-resource management, are also published.

25. In basic space sciences, workshops are being planned in the regions of Asia and the Pacific and of Europe for the period 1996-1997. Selected presentations and lectures delivered at the workshops will be published on a yearly basis. Furthermore, organizations within the United Nations system continue to collaborate with the Committee on Space Research (COSPAR) to support space research activities of scientists from developing countries.

26. Organizations within the United Nations system also make efforts towards the improvement of safety in various human activities. While studies are under way to apply space technology to establish safety systems, such as the Global Maritime Distress and Safety System (GMDSS), consideration is given also to emerging risk and danger as a result of expanding space activities, such as the risk of the use of nuclear power sources in outer space. Space technology can be a solution for safety in many aspects. Conversely, space activities may create a risk which should be dealt with by various organizations.

27. The responsibility of the United Nations for social and economic development on Earth and the protection of the global environment is being emphasized more than ever. The importance of coordination among the organizations within the United Nations system has been underscored in a number of studies

carried out in recent years on the future of the United Nations system. The importance and potential of space science and technology for the prosperity of the Earth and human beings are widely, although not sufficiently, recognized. With high-level coordination among the organizations within the United Nations system in conducting outer space activities, space technology can have a positive impact on various aspects of human activities while contributing to the achievement of goals set within the United Nations system.

28. Since the Administrative Committee on Coordination established a subcommittee on outer space activities in 1975, inter-agency efforts to ensure cooperation among interested organizations in outer space have resulted in a number of projects involving two or more organizations. As the United Nations system enters the third decade of such efforts, it is hoped that this report on the future space activities of the organizations within the United Nations system will lead to even more initiatives to plan and implement inter-agency outer space projects.

III. ACTIVITIES PLANNED BY ORGANIZATIONS WITHIN THE UNITED NATIONS SYSTEM FOR 1996 AND 1997 AND FUTURE YEARS

A. Remote sensing and the Geographic Information System

1. Education and training programmes

Training courses, workshops and seminars

29. The United Nations Programme on Space Applications is planning the following training courses, workshops and seminars in the period 1996-1997:

(a) The Sixth United Nations/Sweden Training Course on Remote Sensing Education for Educators, to be hosted and co-sponsored by the Government of Sweden at Stockholm and Kiruna, Sweden, from 6 May to 14 June 1996;

(b) A United Nations Workshop on Microwave Remote Sensing Applications, to be held in the Philippines in April 1996;

(c) A United Nations/International Astronautical Federation (IAF) Symposium on Space Technology in Developing Countries, to be held in conjunction with the forty-seventh Congress of IAF in 1996.

30. ECA, through its education and training programme in 1996 and 1997, will continue to focus on developing and strengthening institutional, technical and human capabilities in the application of cartography and remote sensing techniques in data collection for natural resource and environmental management, while organizing expert meetings to enhance policies and design legislative guidelines for the use of cartography and remote sensing in social and economic planning (see also paragraphs 129-131 below).

31. The following training courses, workshops and seminars are being planned by ESCAP in 1996 and 1997 with funding support from UNDP and co-financing and cost-sharing by its member States and other donors:

(a) Seminar with hands-on training in tropical ecosystem management, to be held in August 1996 and 1997;

(b) Medium-term Training Course on Sustainable Land Use Planning, to be held in August 1996 and 1997;

(c) Workshop on Integrated Applications of Remote Sensing and GIS for Sustainable Development Planning, to be held in September 1996;

(d) Seminar on Information System for Coastal Zone Development Planning, to be held in November 1996;

(e) Seminar on Space Applications for Poverty Alleviation with Special Emphasis on Women in Development for Asia and the Pacific, to be held in October 1996.

32. FAO plans to organize, jointly or on its own, the following remote sensing training courses, workshops and seminars in 1996 and in future years:

(a) FAO/European Community/ESA fifth subregional workshop for decision makers and agricultural and environmental applications of remote sensing and GIS, to be held in Romania in 1996;

(b) FAO/German Foundation for International Development (DSE) workshop for decision makers on remote sensing and GIS applications, to be held in eastern Africa in 1997;

(c) FAO/ESA workshop for decision makers on remote sensing and GIS applications, to be held, in cooperation with ESCAP, in Asia in 1997;

(d) FAO technical workshops on land-cover mapping, to be held within the framework of the AFRICOVER project in 1996, 1997 and 1998.

33. UNESCO will continue to support the following postgraduate training courses on the applications of remote sensing to natural resource research, management and development:

(a) Postgraduate course in integrated study and rational use of natural resources at the universities of Paris, Montpellier and Toulouse, France;

(b) International postgraduate training courses on remote sensing applications, digital image processing and aerospace surveys for applied geomorphology and engineering geology at the International Institute for Aerospace Survey and Earth Sciences at Enschede, Netherlands;

(c) International postgraduate training course on photo-interpretation applied to civil engineering and to geology, to be given at the Instituto Geográfico Agustin Codazzi at Bogotá.

34. Within the framework of a cooperative project of UNESCO, Intel and Conservation International to be implemented in 1996 to introduce GIS and computerized technologies in biosphere reserves in developing countries, short-term GIS training courses will be organized for biosphere reserve managers.

Fellowships

35. In promoting the development of indigenous capability, the United Nations Programme on Space Applications, with the assistance of the Governments of Brazil and China, as well as ESA, will award long-term fellowships for the in-depth training of participants from developing countries in the area of research and applications in remote sensing technology.

36. ECA, in support of human resource development in remote sensing and GIS in Africa, will continue to solicit fellowships from entities within the United Nations system, as well as from donor countries and other agencies.

37. ESCAP will organize advanced training courses in 1996 and 1997 to enable up to 15 professionals to become trainers in remote sensing and GIS applications through fellowship studies. The training will be arranged on a cost-sharing basis with a UNDP-funded ESCAP project on GIS and remote sensing. Fellowships will be provided by the host government.

38. FAO will continue providing fellowships and organizing study tours within the framework of remote sensing technology transfer activities of field projects in the period 1996-1997.

Provision of training materials or facilities

39. ESCAP will conduct studies and surveys to prepare training materials, guidelines and inventories on regional remote sensing and GIS development applications. The following activities will be carried out in the period 1996-1997:

(a) Establishment of the Earth Space Information Network for Natural Resources and Environment Management in the Asia Pacific Region, in 1996 and 1997;

(b) Establishment of guidelines for the standardization of GIS for natural resources and environment management and development planning, in 1996;

(c) Establishment of an inventory of facilities and a roster of specialists involved in GIS and remote sensing for natural resources and environment management and development planning, in 1997;

(d) Maintenance and updating of the Regional Information Services Database on Remote Sensing and GIS, in 1997.

40. Within the framework of seminars, training courses and workshops, the Land and Water Division and the Forest Resources Division of FAO collaborate with the Remote Sensing Centre and other relevant services on the development of computer-based tools for analysing and disseminating remote sensing data and information products.

2. Expert services and survey missions to identify specific areas of applications relevant to a given country or group of countries and to carry out specific studies on pilot projects or to implement the projects with operational applications of technology

Provision of expert services and survey missions

41. The United Nations Programme on Space Applications will continue to provide technical advisory services to the Government of Ecuador for promoting regional cooperation, administration and funding of the ground receiving station at Cotopaxi (A/AC.105/587, para. 47).

42. The Programme, in cooperation with the Department for Development Support and Management Services and ESA, will continue its efforts to identify and implement support mechanisms to enable scientists from Africa, Asia and the Pacific, and Latin America and the Caribbean to receive and utilize data from the Land Remote Sensing Satellite (LANDSAT), Satellite pour l'observation de la Terre (SPOT) and European remote sensing satellites (ERS) of ESA.

43. The Office for Outer Space Affairs continues to provide support to the Government of Chile, at the request of the latter, in its follow-up activities, as *pro tempore* secretariat, of the recommendations of the second Space Conference of the Americas, which was held at Santiago from 26 to 30 April '993 (A/AC.105/551, para. 44). At the request of the Government of Uruguay, which will host the third Space

Conference of the Americas in 1996, the Office for Outer Space Affairs is prepared to provide any necessary support to the Government.

44. The Department for Development Support and Management Services continues to provide technical support to Member States to improve, among others, the planning and management of energy and natural resources, as well as operational cartographic activities related to the recommendations derived from Agenda 21.[1] For 1996 and 1997, the Department is planning activities through which GIS and land information system (LIS) technology will be disseminated to the international community through seminars and expert services, as well as technical advisory missions.

45. It is expected that the plan to decentralize the natural resource and energy programme, which was initiated by the Secretary-General, will be actually implemented in the biennium 1996-1997. In accordance with the plan, the regional commissions will work jointly with Headquarters under a single and unique cooperative programme between the regional commissions and the Department for Development Support and Management Services.

46. In the light of the above, ECA expects that services to member States will continue to expand, as was the case for 1994 and 1995. In 1996 and in future years, particular attention will be given to its sponsored regional training and service remote sensing centres, when new medium-term programmes will be initiated for both the Regional Centre for Training in Aerospace Surveys (RECTAS) and the Regional Centre for Services in Surveying, Mapping and Remote Sensing (RCSSMRS). In this context, the proposals of ECA to reorient the functions and activities of the centres will be pursued in accordance with the results of the assessment in 1995 of the African remote sensing programmes and the real results achieved so far by the centres. The harmonization and rationalization of ECA-sponsored regional institutions will continue to be a priority objective until a final decision is made on the future activities of the regional centres. ECA progressive studies on the matter, presented at its Conference of Ministers of the Commission in 1992, 1993 and 1994, recommended the merging of some institutions and the conversion of others into specialized agencies of subregional economic communities. It was recommended that RECTAS and the Ouagadougou Regional Remote Sensing Centre (CRTO) should be merged into one centre.

47. ESCAP will conduct consultative meetings with missions to donor agencies to arrange for cost-sharing and co-financing of regional GIS and remote sensing activities during 1996.

48. Each year, the FAO remote sensing, agrometeorology and GIS centre provides technical support, including advisory services, formulation, backstopping and evaluation of field projects, to about 50 developing countries in Africa, Asia, Latin America and the Caribbean and central and eastern Europe. In addition, FAO provides support to the International Fund for Agricultural Development (IFAD) and the World Food Programme (WFP) for their field project activities.

49. FAO will continue to cooperate with the regional commissions and regional remote sensing centres in the efficient use of remote sensing technology for the mapping, assessment and monitoring of renewable natural resources and natural disasters. The priorities of this assistance will follow the Agenda 21 recommendations of the United Nations Conference on Environment and Development.

50. FAO will continue its assistance to the Government of Afghanistan in preparing for the rehabilitation of the agricultural sector through an inventory of current land utilization based on satellite remote sensing and GIS technologies. Such assistance will also be provided to Albania, Iran (Islamic Republic of) and Pakistan.

51. FAO will implement phase II of its regional remote sensing/food security early warning project for the member States of the Southern African Development Community (SADC) with funding by the Government

of the Netherlands. FAO will also continue its sister project for the countries of the Intergovernmental Authority on Drought and Development (IGADD) with funding by the Government of France.

52. FAO will continue its assistance to countries in the Caribbean subregion in establishing LIS based on aerial photography, satellite remote sensing and orthophotomapping. At present such assistance is being provided to Barbados, Belize and Trinidad and Tobago, and possibly to Guyana and Haiti.

53. FAO will continue to assist countries in central Europe in increasing their capacities for agricultural and environmental applications of remote sensing and GIS. In particular, FAO will continue to offer advice on the use of remote sensing and GIS in planning and implementing agricultural land reform and in assessing and monitoring environmental damage. At present, such assistance is being provided to Albania, Czech Republic, Hungary, Poland and Slovakia.

54. FAO continues to contribute, with the use of remote sensing technology, to the development of schemes to control pest diseases. Earlier studies relating ARTEMIS normalized difference vegetation index data sets to tsetse fly distribution and land utilization types in Nigeria and Togo led to the establishment of an operational information system to define policies for African animal trypanosomiasis control. Remote sensing is used to define technical concepts for tsetse control in countries where high resolution satellite images are available to discern land utilization types. A project is currently being prepared to design maps and GIS to assist 11 western African countries affected by onchocerciasis.

55. In the field of agricultural statistics, FAO continues to assist approximately 10 developing countries in satellite imagery techniques, which can be used for geographical stratification (subdivision in homogenous land units), area sampling frame, regression estimate and area sampling surveys.

56. UNESCO, in cooperation with the Center for Remote Sensing of Boston University in the United States of America, will assist in 1996 the Omani authorities in establishing a GIS and a digital image-processing laboratory.

Study, pilot projects and operational applications

57. The Office for Outer Space Affairs and FAO continue to have discussions with the United Nations International Drug Control Programme (UNDCP) to define possibilities for cooperation in the use of remote sensing technology by UNDCP. The subjects of the discussions include the organization of expert meetings in 1996 and beyond regarding remote sensing and associated technologies to consider the use of satellite data for detecting and monitoring narcotic crops, monitoring alternative development projects and crop substitution activities, and determining environmental damage due to narcotic planting, processing and distribution. Projects are being conducted by FAO in Afghanistan, Colombia and Lebanon. Plans are also being made for an expert consultation (see paragraph 93 below).

58. In a holistic study initiated by UNDCP and undertaken by the FAO Remote Sensing Centre, an attempt will be made to determine the potential role of remote sensing technologies for gathering inventory on and monitoring the extent of illicit crop cultivation. The study is expected to lay the foundation for a workshop in early 1996 to discuss the technical feasibility and operational requirements of programmes for the application of remote sensing technologies for the above-mentioned purposes. Remote sensing projects of this sort are being considered for Lebanon and Myanmar and could be extended elsewhere if the technology proves effective. Those activities are being coordinated by the Division for Operational Activities and Technical Services of UNDCP.

59. The Department of Humanitarian Affairs of the Secretariat continues to promote and direct activities of the International Decade for Natural Disaster Reduction (1990-1999) (General Assembly resolution 44/236 of 22 December 1989) through the secretariat of the Decade. As a part of the activities for the Decade,

special attention has been directed towards using remote sensing and space technology monitoring and reducing the impact of natural disasters. Several projects for the Decade developed by Governments and specialized agencies are aimed at improving the use of satellite monitoring and communication systems so as to widen their actual geographic coverage and to enhance the dissemination of effective warnings in case of disaster.

60. As a part of the above-mentioned activities, the World Conference on Natural Disaster Reduction, organized by the secretariat of the Decade, was held at Yokohama, Japan, from 23 to 27 May 1994. The Conference adopted the Yokohama Strategy for a Safer World: Guidelines for Natural Disaster Prevention, Preparedness and Mitigation,[2] and its Plan of Action, in which it requested the United Nations, through the secretariat of the Decade, to provide Governments, upon request, with technical assistance in the preparation and development of disaster management plans and programmes.

61. UNEP, through its GRID facility at Geneva, continues to work closely with the Department of Humanitarian Affairs and the secretariat of the Decade in the development of Global Information Systems on Natural Hazards (GISNH) for that facility, in order to ensure that the results are useful for natural hazard research and operational applications. GISNH is a "meta-database" of natural hazard databases established worldwide at various agencies and organizations. It allows the user to search for and obtain a wealth of information on historical occurrences of natural hazards for application on a global, regional or local scale. GISNH is also a contribution of the GRID facility at Geneva to the on-line HazardNet project of the Decade and Simon Fraser University at Vancouver, Canada.

62. Environmental monitoring at the global, regional, national and local levels requires new and innovative approaches to the analysis of multi-course, multi-scale and multi-temporal spatial data sets. There is a constant, pressing need for establishing a base of scientifically proven analysis techniques to support environmental sensing using remotely sensed data. UNEP, through its GRID facility at Sioux Falls, South Dakota (United States), will continue its cooperation with scientists of the Earth Resources Observation System Data Center in the development of algorithms and techniques for change detection using remotely sensed data in support of operational programme needs.

63. UNEP, through its GRID facility at Sioux Falls, is collaborating with the United States Geological Survey in the development of a global land cover characteristic database using advanced very high resolution radiometer (AVHRR) data (with 1 km resolution) from the National Oceanic and Atmospheric Administration (NOAA) polar-orbiting satellite. This will also include other ancillary information such as data on elevation, eco-regions, climate and soils. The tasks involved are AVHRR time series data assembly, ancillary data collection, interpretation, validation and evaluation, and product generation. The land cover classification for North America is complete and the one for South America was scheduled to be completed by late 1995. The global database will be completed in 1997. The land cover characteristics database is designed for a wide variety of environmental and sustainable development applications. Operational uses of the data include weather forecasting, fire danger modelling, air pollution assessments and crop condition analysis. The land cover classification for North America is being used by the North America Commission on Environmental Cooperation for continental reporting on the state of the environment. In addition, experimental work has demonstrated the utility of this data set for carbon stock inventories and other types of land process modelling. Several other agencies of the United States, including the National Aeronautics and Space Administration (NASA), the Environmental Protection Agency and the forest service, are also cooperating in this project.

64. UNEP, through the GRID facilities at Bangkok and São José dos Campos, will continue to contribute to an effort similar to the one mentioned above. The UNEP contribution will also include, depending on the availability of funds, establishment of regional expert panels to develop suitable classification systems and to evaluate the accuracy and utility of national, continental and global data sets being developed under land-cover characterization studies. There will be possibilities for experts from developing countries to participate

in database development by working at the GRID facility at Sioux Falls for periods ranging from six months to one year. The development of an appropriate statistical sampling strategy for validation of results will also be continued.

65. UNEP, through its Environment Assessment Programme for Asia and the Pacific, is engaged in the macro-scale land-cover assessment and monitoring of selected countries in the region using AVHRR data. Land-cover mapping for Bangladesh, Cambodia, Lao People's Democratic Republic, Myanmar, Nepal and Viet Nam for the periods 1985-1986 and 1992-1993 was completed in 1994. Data for Pakistan and Sri Lanka are currently being processed and analysed. Negotiations are under way with China, India, Indonesia and Iran (Islamic Republic of) for possible extension of the project to those countries. Two "hot spots" (major disturbance fronts), one in the northern part of the Lao People's Democratic Republic and the other at the Mekong delta in Viet Nam, have been identified for further investigation using high-resolution data from LANDSAT thematic mapper and SPOT. Meteorological guidelines on the use of AVHRR data for the assessment and monitoring of major land-cover types in the region are being developed. Those activities are expected to continue in 1996 and beyond.

66. UNEP, through its GRID facility at Sioux Falls, will continue in the period 1995-1996 to contribute towards the further development of algorithms and techniques for the automatic identification and extraction of various phenologically indicative parameters from time series AVHRR (with 1 km resolution) normalized difference vegetation index composites.

67. Through its Desertification Control Programme, which was carried out in association with Institut géographique national - France international (IGN-FI) for the period 1987-1992 (A/AC.105/587, para. 78), UNEP will continue to implement the following projects in 1996 using remotely sensed data: (a) national land degradation assessment and mapping in Kenya (in collaboration with the Governments of Kenya and the Netherlands); and (b) qualitative and quantitative assessment and mapping of desertification in two countries in the ESCAP region (in collaboration with Governments and ESCAP).

68. UNEP and UNESCO will continue cooperation with the Scientific Committee on Problems of the Environment of the International Council of Scientific Unions (ICSU) in 1996.

69. UNEP, through its Environment Assessment Programme (EAP), will continue the Soils and Terrain (SOTER) database activities throughout 1996. A joint GEMS and FAO activity involves the development of a SOTER database on the scale 1:5,000,000 for Latin America, which is implemented by the International Soils Reference and Information Centre.

70. UNEP, through its EAP, including GEMS and GRID, will continue to contribute to the work of the Committee on Earth Observation Satellites (CEOS) as an affiliate.

71. UNEP, through its GRID facility at Sioux Falls, in cooperation with the United States Geological Survey, will expand the coherent high-resolution 30-arc-second global, digital elevation data set, the work for which was initiated in 1994. The work on Africa and North America is complete, and data sets on Africa were made available in 1995 on the World Wide Web homepage of the GRID facility at Sioux Falls.

72. UNEP, through the GRID facility at Arendal, Norway, will initiate in 1996 the development of an environmental atlas for the Barents region. A wilderness map for the region and an operational pilot database containing selected geographical data sets have been completed. There are plans to develop by 1997 a pilot version of a GIS-based environmental atlas for the Barents region.

73. UNEP, through its GRID facility at Arendal, is supporting a pilot study to establish the methods and organizational framework for the implementation of an extensive Arctic environmental database for Asia and

Europe. In addition, the pilot study will, in 1996 and beyond, lead to the establishment of a database containing high-priority GIS data and an extensive reference database.

74. UNEP cooperation with the World Conservation Monitoring Centre (WCMC) at Cambridge, United Kingdom of Great Britain and Northern Ireland, will continue in 1996 and beyond.

75. Through its GRID facility at Geneva, UNEP, in consultation with WCMC, the European Forest Institute at Joensuu, Finland, and the Joint Research Centre of the European Commission at Ispra, Italy, has completed the first version of a European survey of forest and other maps possessed by international, regional and national agencies in both analog and digital format, including those obtained by space-based means. The results have been incorporated in an on-line database product, and the first printed version was to be distributed in September 1995 to all survey participants and other interested parties. The database will also be made available as a diskette product, and updates will continue to be incorporated in the database in 1996.

76. UNEP, through its GRID facility at Geneva and its joint environment unit with the Department of Humanitarian Affairs is examining the feasibility of a pilot study on the applicability of space-based data for emergency response. The study would follow at least one environmental catastrophe, chemical or oil spill, forest fire, manufacturing plant explosion or a natural disaster, which could be analysed using satellite imagery. Which catastrophe would be covered by the study has not yet been determined. The purpose of the study would be to determine the practicality of the use of space-acquired data for operational purposes, as well as to strengthen cooperation among United Nations agencies in an emergency response situation.

77. UNEP, through a project managed by its GRID facility at Arendal, is assisting the Consultative Group on International Agricultural Research in the application of GIS technology in agricultural research management. Cooperative links between UNEP and the international agricultural research centres of the Consultative Group are being forged to integrate natural resources and socio-economic data and information into agricultural research activities in a more effective manner. Project activities include (a) strengthening the network between the research centres and GRID facilities; (b) holding workshops to consider Consultative Group needs and refinement of project implementation strategy; (c) GIS technology transfer among the research centres and GRID nodes; and (d) identification of, access to, and/or generation of priority data sets for agricultural research, such as climate, population and soil databases on suitable scales.

78. UNEP, through its GRID facility at Arendal, will cooperate with its partner organizations in increasing the utility and reliability of the Digital Chart of the World for GIS applications by conducting quantitative assessments of its reliability and accuracy in selected areas of interest. The results will be coupled with feedback on the experiences of users in those areas.

79. ECA will undertake in the biennium 1996-1997 the following studies and projects:

(a) Study on mapping and LIS as the foundation for sustainable development of resources;

(b) Study on the status of natural resources and environmental baseline information in Africa with emphasis on the role of the private sector;

(c) The third and fourth phases of the Digital Cartographic Inventory Atlas project;

(d) The production of the first phase of a digital atlas on natural resources and energy in Africa.

80. ECA will cooperate with FAO in planning, coordinating and implementing activities of the AFRICOVER project (see also paragraphs 96 and 97 below).

81. In the period 1996-1997, ESCAP will continue or will start the following pilot projects in its region as collaborative projects to promote and customize remote sensing and GIS operational use in natural resources and environment monitoring:

(a) Pilot project on remote sensing in support of the implementation of Agenda 21 in the subregion of the Association of South-East Asian Nations (ASEAN);

(b) Integrated study on sustainable development in arid zone;

(c) Coastal zone development and environment monitoring using integrated GIS and remote sensing technology.

82. FAO and ESA will continue their cooperation in developing appropriate techniques for the application of satellite synthetic aperture radar imagery to agriculture and forestry in developing countries. Similar cooperation has started between FAO and the Canada Centre for Remote Sensing. A pilot study on the use of ERS-1 and ERS-2 data for land-cover mapping in Africa is in progress.

83. FAO is continuing cooperation with the Government of France in developing operational methodologies for applications of high-resolution remote sensing data in international development projects through the implementation of pilot studies. The results are published in the FAO Remote Sensing Centre series of technical publications and brochures for decision makers. In addition, the Government of France is supporting FAO in the field of standardization and harmonization of methodologies on the use of remote sensing and GIS techniques.

84. The feasibility study on a global operational forest-cover monitoring network based on satellite remote sensing, which was conducted by FAO in cooperation with the National Aerospace Laboratory (NLR) of the Netherlands and the Agricultural University of Wageningen, will be followed by other feasibility studies as required by the global Forest Resources Assessment (FRA) project of FAO in 1990.

85. The 1990 FRA project, a survey of pan-tropical resources, demonstrated that information on changes in forest and land use can be obtained on a global basis in a cost-effective, timely and statistically sound manner. FAO concluded that such surveys, if continued over time, would lend factual support to global environmental researchers and policy makers by providing detailed descriptions of the processes of change and the quantification of essential parameters on a reliable basis. In view of the international community's information needs, in particular, for studies on global change, FAO intends to continue to build consistent and reliable time series observations of forest and land use.

86. In this connection, FAO will consider the following recommendations to design activities for 1996 and beyond:

(a) Statistical designs and analytical systems for series of transition matrices should be further developed:

(i) To use the auxiliary information such as the one on existing wall-to-wall forest classification based on AVHRR data (with 1 km resolution) from NOAA, as well as other statistical and spatial information databases (Forest Resources Information System, GIS layers);

(ii) To improve estimates for change by stratifying parameters that would reduce the variance of forest area changes such as demography, economic indicators and infrastructure;

(b) Sound monitoring procedures such as interdependent remote sensing analysis should be further promoted for their implementation to obtain location specific information in order to assist decision-making;

(c) The vegetation classifications which have been adopted at the country level in response to local needs should be maintained to the extent possible, compatible with global standards to allow full contribution to the global base.

87. With the Government of the Netherlands, FAO is preparing a new cooperative programme, Pilot Remote Sensing Processing and Archiving System for Forest Assessment and Monitoring RESPAS. The project will produce geometrically corrected remote sensing data, optimized for forest applications, for national and subnational forest departments and the National Tropical Forests Action Programme units to establish and/or strengthen the capacity of developing countries to assess and monitor their forest resources. It could be further developed to be integrated with GIS and other databases, such as the Forest Resources Information System, and with simulation and modelling capabilities to assist in the planning and definition of forestry policies. The Tropical Forest Action Plan Coordination Unit and the Field Programme of FAO would be the main users. This project has already started with a user needs assessment in order to meet user requirements at a national level for managing forest areas and a preliminary outline for the RESPAS system concept. The countries that should be involved in this pilot project are Colombia, Guinea, Kenya and the Philippines.

88. FAO, through ARTEMIS, will continue the operational monitoring of growing conditions and vegetation development over Africa, for use in early warning for food security and desert locust control. This will include the distribution of ARTEMIS images by electronic means to authorized users, by way of an e-mail data server on the ARTEMIS server which was to be implemented in 1995. FAO will also continue to support the establishment, or improvement, of local reception and/or processing systems using low-resolution environmental satellites, including the development of improved interpretation techniques.

89. FAO will continue its work on sustainable management of agricultural, forestry and fisheries natural resources and on its Global Information and Early Warning System on Food and Agriculture (GIEWS) with a view to increasing the use of remote sensing inputs and their integration with other inputs in GIS.

90. FAO will continue to assess existing forest resources and trends in deforestation, forest degradation and plantations. A number of pilot studies will be undertaken to test new data and to develop appropriate methodologies. An operational workplan is being prepared by the Joint Research Centre at Ispra and by FAO in order to integrate the use of NOAA-AVHRR defined by the Tropical Ecosystem Environment Observations by Satellite (TREES) and MERCATOR projects and the methodology used in the FRA project and AFRICOVER.

91. Within the framework of its inputs to ongoing and planned global environmental programmes such as GTOS, FAO will continue its cooperation with organizations within the United Nations system, specialized agencies and other international organizations by providing remote sensing expertise and by participating in pilot studies in areas within its mandate. FAO also cooperates with UNEP and UNESCO by participating in working groups on the harmonization of land-use and land-cover classification.

92. FAO contributes to the preparation of four projects of the Observatoire du Sahara et du Sahel:

(a) Assessment and monitoring of land degradation and desertification in North African countries, with the Centre régional de télédétection des états de l'Afrique du Nord (CRTEAN);

(b) Harmonization of the uses of NOAA-AVHRR and Meteosat data for environmental monitoring;

(c) Participation in AFRICAGIS, the main international forum on GIS and environmental information system (EIS) technologies in Africa;

(d) Setting up of a long-term ecological observatory network (ROSELT) in Africa within the framework of GTOS activities.

93. FAO is continuing to cooperate with UNDCP on pilot projects to determine the location of narcotic crop cultivation sites using satellite remote sensing data. This cooperation has yielded very promising results and is being expanded. Planned studies will use high-resolution data from new optical and microwave Earth observation satellite systems. Increased use of GIS and expert systems for modelling and forecasting is also planned for 1996 and 1997 (see also paragraph 57 above).

94. A technical capability for processing and distribution of ARTEMIS data for western and central Africa is currently being developed within the FAO Regional Office for Africa at Accra. Cooperation is being established with various institutions in Benin, Côte d'Ivoire and Ghana for supporting applications development and calibration activities.

95. The ARTEMIS vegetation index products will be extended to cover the entire regions of Asia and Latin America, in addition to their current coverage of Africa and south-east Asia. FAO has developed a 10-year archive of ARTEMIS vegetation data. A new programme named Reconnaissance and Management System of the Environment of Scmistocera (RAMSES), was scheduled to start in 1995, to be implemented for three years, with the support of the Government of Belgium. The objective of the programme is to improve the use of NOAA-AVHRR data for the early detection of locust areas in Africa. The programme will be carried out within the framework of the new FAO Emergency Prevention System (EMPRES) for the transboundary plant pest and animal diseases programme.

96. GIEWS has the unique responsibility of providing early warning of food security emergencies for the whole world. Remote sensing and agrometeorological data and information are used as inputs in the evaluation and assessment process. The development of models to integrate satellite and agrometeorological data with socio-economic and nutritional information, using GIS technology, is currently being finalized under the GIEWS risk mapping project. The project is being implemented by FAO in partnership with the Save the Children Fund in London and executed by GIEWS with financial assistance from the European Union.

97. The AFRICOVER project, which started in 1995 and will be implemented for more than five years, aims to establish a land cover digital database for and by each national and regional African competent body and to produce land-cover maps on the scale 1:250,000 (1:1,000,000 and 1:100,000 in certain cases), using the same geographic references and projection system in Africa, as well as a common harmonized legend, with updated information on drainage, toponym, roads and land-cover features, to list a few. It will be implemented in African regional and national remote sensing centres and mapping agencies under the supervision of FAO. The project will strengthen African capacities in advanced geographic information technologies on environment and natural resources in order to fill the information gap and to provide common tools for obtaining geographic information at the national and regional levels, at various map scales, and according to national and regional needs.

98. The eastern African component of AFRICOVER was started in 1995 with an Italian contribution of US$ 5.47 million. The activities will be conducted on a regional basis and will be based at RCSSMRS at Nairobi. Following the recommendation of a technical meeting organized by FAO and ECA at Addis Ababa in July 1994, working groups were established in 1995, with the support of the Government of France, are to undertake preparatory work for specifications of products, standardization of methodologies, classification and legend, as well as validation of provided information and a common geographic reference system. FAO has supported follow-up to the meeting at Addis Ababa by providing necessary resources. The World Bank is preparing, together with FAO, an important project in central Africa related to deforestation and biodiversity problems. The AFRICOVER project represents a total budget of between US$ 30 million and US$ 50 million, depending on the options taken.

99. FAO and ESCAP are preparing the OLIVIA programme for the development and implementation of a comprehensive operational satellite environmental monitoring system for Asia and the Pacific, in support of sustainable development. UNEP and the Asian Institute of Technology (AIT) at Bangkok were involved

during the preparatory phase of the programme. The initial three-year phase foresees the formulation and implementation of a number of focused and interrelated pilot projects. Multi-donor support will be solicited. China is interested in being one of the key countries for the development of the OLIVIA programme.

100. FAO, through the new Environmental Information Management Service which belongs to the new sustainable development department, is continuing its efforts to optimize the use of remote sensing, GIS and agrometeorological technologies and to effectively transfer and integrate their use into the activities of its member States for the specific purpose of enhancing the timeliness and cost-effectiveness of data collection; inventory, monitoring and management of resources at various levels; and early warning and environmental monitoring.

101. In 1996 and 1997 and beyond, FAO envisages the use of GPS in surveys and the integration of remote sensing data into GIS-based land resource information systems. FAO is considering using remote sensing to assess and monitor the progress of soil and water conservation works carried out in the field within the framework of WFP-assessed national programmes.

102. The Investment Centre of FAO uses remote sensing data to supplement or update geographic information needed for the preparation of projects. In addition, it is incorporating more remote sensing components in projects concerned with the development and management of natural resources. Guidelines for the use of remote sensing in the design of investment projects are now ready for publication.

103. The Land Regularization Task Force, which has been established by several divisions within FAO, continues to coordinate activities related to LIS. LIS depends upon remotely sensed data, primarily aerial photographs and orthophotomaps, in constructing effective multi-purpose cadastral and land record systems for land registration and administration.

104. GOOS of the Intergovernmental Oceanographic Commission will continue to contribute to the work of CEOS in the development of user requirements for sensors and data management systems.

105. The implementation of the cooperative programme of UNESCO and the International Institute for Aerospace Survey and Earth Sciences (ITC) called "Geoinformation for environmentally sound management of natural resources", was successfully completed in 1995. The programme focuses on the application of GIS and remote sensing in the fields of ecology, hydrology and geology. The organization of the second phase concerning training is being considered for the coming years.

106. Within the framework of its Man and the Biosphere programme, UNESCO continues to develop, in cooperation with UNEP, the National Institute for Research in the Amazon (INPA) of Brazil and the Institut français de recherche scientifique pour le développement et coopération (ORSTOM) of France, a multidisciplinary research programme on the economic and ecological sustainability of tropical forest management in the central Amazonia region. Remote sensing technologies will be used for natural resource surveying and mapping.

107. UNESCO is negotiating the establishment of a remote sensing centre at the Libyan Secretariat for Research, within the framework of a research project aimed at studying the natural resource potential in the south of the Libyan Arab Jamahiriya. FAO will cooperate in establishing the centre relating to agricultural applications.

108. Within the framework of the joint programme of UNESCO and the International Union of Geological Sciences called GARS, UNESCO will continue to implement the following activities:

(a) The third phase of the GARS project in Africa concerning the development of a regional remote sensing user network will continue to be implemented in cooperation with the Royal Museum of Central

Africa in Belgium. The network currently includes Burundi, Rwanda, Uganda, United Republic of Tanzania and Zambia. Moreover, remote sensing data interpretation capabilities will be added in the UNESCO Africa project called Pan-African Network for a Geological Information System, also implemented in cooperation with the Royal Museum and the Centre international pour la formation et les échanges géologiques of France;

(b) UNESCO will implement the final phase of the GARS project in Latin America, which focuses on mountain hazard and landslide mapping of the Andean subregion with the use of microwave spaceborne sensor data in the study of natural hazard mitigation. Results of this research study will be published in 1996;

(c) The initial phase of the new GARS project in Asia concerning the monitoring of pre-active volcanoes in the Philippines will be implemented. The project is aimed at developing new methodologies for the acquisition of additional or new information for volcanic hazard assessment and prediction, using remote sensing techniques.

109. UNESCO cooperates with the Council of Europe, within the framework of the latter's Open Partial Agreement on the Prevention of, Protection against and Organization of Relief in Major Natural and Technological Disasters, in conducting research studies related to the use of space technology in disaster management.

110. UNESCO, Intel and Conservation International will implement in 1996 a cooperative project which introduces GIS and computerized technologies in about 25 biosphere reserves in developing countries.

111. UNESCO, in close collaboration with national authorities concerned and international institutions such as ITC, will continue to monitor selected cultural sites inscribed in the World Heritage List, using remote sensing methods and GIS. The historic sites of Angkor in Cambodia and Moenjodaro in Pakistan are among those sites.

112. UNESCO, within the framework of the Space Archaeology Programme, will continue to develop cooperation with space agencies such as NASA of the United States, National Space Development Agency (NASDA) of Japan and Centre national d'études spatiales (CNES) of France for the use of satellite data in field research activities, including acquisition of new information on known sites, extension of the study of archaeological sites to the geographical environment and archaeological site prospecting.

3. Dissemination or exchange of information on the status of technology or operational systems through meetings or publications and/or policy coordination

Dissemination of technological information

113. Since 1989, the United Nations Programme on Space Applications has published an annual collection of papers selected from among those presented at the meetings, workshops and training courses organized under its auspices. The publication, entitled *Seminars of the United Nations Programme on Space Applications: Selected Papers on Remote Sensing, Satellite Communications and Space Science*, covers different aspects of space science and technology. It includes papers that are broad in scope and of enduring interest. The seventh edition, which will be issued in 1996, will contains manuscripts concerning remote sensing from the activities of the Programme conducted in 1995 at Harare and Stockholm.

114. The Office for Outer Space Affairs will prepare a study on the use of remote sensing technologies for environmental applications, particularly in support of the recommendations of the United Nations Conference on Environment and Development.

115. UNEP, through its GRID facility at Sioux Falls, will update its comprehensive analysis of data policies of current and planned satellite systems in the period 1995-1996. The aim is to update the information on

market intelligence concerning the above-mentioned subject for United Nations entities and developing countries and to help them in formulating suitable strategies for the purchase of commercial products from the different satellite systems.

116. UNEP, through its various GRID facilities, will continue to move towards on-line data distribution services through the Internet in 1996. Links and pointers to other "meta-data" systems are also under development.

117. UNEP, through its GRID facility at Arendal, continues its support to the Arctic Environment Protection Strategy (AEPS) by cooperating with the Arctic Monitoring and Assessment Program (AMAP), the Conservation of Arctic Flora and Fauna Programme (CAFF), the programme on Protection of the Arctic Marine Environment (PAME) and the AEPS indigenous people programme. AMAP monitors and assesses the effects of pollution within the Arctic, and the GRID facility at Arendal provides support through spatial database development and applications and the production of thematic maps. Of particular importance to UNEP is the development of an AMAP project directory, a comprehensive catalogue of Arctic monitoring projects. In support of CAFF, the GRID facility at Arendal will produce a GIS database of proposed protected areas. GRID will also cooperate with the Russian CAFF group in conducting an analysis on the representativeness of existing and proposed protected areas in the Arctic. As for PAME, the GRID facility at Arendal assists in presenting key data and producing base data sets and GIS data. A major component of this cooperation will be a GIS database and map outputs based on the results of a survey of point location for pollution in the circumpolar Arctic.

118. UNEP, through its GRID facility at Arendal, will host the secretariat of the International Arctic Environment Data Directory. In cooperation with a network of major institutions holding information on the Arctic environment, GRID will initiate further development of the Directory in 1996. The Directory will provide comprehensive information on existing data sources dealing with all aspects of the Arctic environment. It will be open to institutions located in the Arctic, as well as those which use directories of environmental information concerning the Arctic.

119. UNEP, through its GRID facility at Arendal, officially made available on the World Wide Web in August 1995 a comprehensive report on the state of the environment to enable millions of users all over the world to monitor Norwegian efforts and achievements on the environment. The report provides a survey of the current state of the environment and of efforts being made in important fields such as climate changes, acid rain, biodiversity and pollution. The report targets mainly secondary schools, the general public and politicians and will be updated yearly to demonstrate environmental changes over time.

120. GRID provides ready access to several thousand environmental data sets, of which approximately 40 per cent are derived from satellite sensors. The GRID Meta-Database Management System will be implemented in 1996 and will provide a catalog (electronic and hard copy) of worldwide GRID data resources. It will also provide pointers to other "meta-data" sources such as the NASA master directory, a means of systematic reference data entry among GRID-compatible centres, and will assist in the harmonization of "meta-data" among different "meta-data" directories.

121. The GRID mission includes dissemination of timely and reliable geographically referenced environmental information to scientists and decision makers around the world to help them address global, regional and national environmental issues. In order to assist in closing the gap between developed and developing countries in the use of remotely sensed data, mainly because of lack of information on the availability of data, the GRID facility at Sioux Falls has compiled an exhaustive list of such data sets, such as NASA Pathfinder projects, the North American landscape characterization and the humid tropical forest inventory, as well as the NASA data grant program. The list has been distributed to all GRID facilities around the world.

122. UNEP, through its GRID facility at Arendal, will continue to provide users with sample maps of ultraviolet intensity covering Europe during various seasons, calculated from sun-angle and total ozone mapping spectrometer measurements. The maps are available to the general public through the homepage of the GRID facility at Arendal on the World Wide Web.

123. ECA will continue to publish its cartographic and remote sensing bulletin, of which four issues have been published.

124. ESCAP will continue to expand its national information network contact points to provide operational Regional Information Service.

125. ESCAP will continue to publish the *Quarterly Remote Sensing Newsletter*, which has been renamed the *Space Technology Applications Newsletter*, during 1996 and 1997. The biannual *Asian-Pacific Remote Sensing Journal* will be renamed the *Asian-Pacific Remote Sensing and GIS Journal* and will also be published in the period 1996-1997. Both of those publications are covered by the ESCAP regular budget publication programme.

126. ESCAP will also prepare, publish and disseminate the following special publications as part of its regular information service activities:

(a) Series of reports on problems and solutions in the applications of GIS and remote sensing for integrated natural resources and environment management, in 1996 and 1997;

(b) Reports on pilot projects conducted under the regional programme on remote sensing and GIS applications by member States, in 1996 and 1997;

(c) Proceedings of seminars, symposia, workshops and meetings organized by ESCAP in 1995, 1996 and 1997;

(d) Manual of guidelines for special applications of GIS and remote sensing, including guidelines for GIS and remote sensing systems for natural resources and environment management, in 1996;

(e) *Space Technology Applications Capability in Asia and the Pacific: An Inventory (1996-1997)*, in 1997.

127. The ECE Statistical Division, under the auspices of the programme of work of the Conference of European Statisticians, organizes activities to improve the efficiency and comparability of the geographic dimension of official statistics in national statistical offices of ECE member States. Within this framework, the ECE secretariat has organized since the beginning of 1993 annual work sessions on GIS with the aim of exchanging experiences in the development and implementation of statistical GIS applications in national and international statistical agencies and of considering concepts and standardization related to statistical GIS, methodological aspects of GIS applications in statistics and marketing issues related to GIS. The next session will be hosted by the United States Bureau of Census at Washington, D.C., from 15 to 18 April 1996. National statistical offices of ECE member States and all international organizations concerned will participate in those sessions.

128. The preparation of technical publications and brochures for decision makers have always been among the main priorities of FAO. In the period 1994-1995, five new issues of the publication series were prepared in English and French in cooperation with the Centre national de télédétection de Tunisie and distributed worldwide. New themes are being identified for publication and distribution in the period 1996-1997.

129. UNESCO will assist the European Association for the International Space Year (EURISY) in the organization of two colloquiums, on the use of space technology in the study of environmental problems in the Mediterranean region and on the role of space technology in environmental management, which will be held in Italy and the Russian Federation, respectively, in 1996.

Elaboration of strategies or plans for future applications programmes or systems and/or policy coordination

130. ECA will organize during the biennium 1996-1997 an ad hoc expert group meeting on guidelines for natural resource and energy development in Africa, with emphasis on privatization and deregulation. The participants will consist of policy makers and natural resource and development operators from the private and public sectors and will include experts on remote sensing and GIS (geomatics). The group will discuss and finalize a paper on the conditions of the private contribution to the development of natural resources and energy in Africa.

131. ECA also envisages organizing in the period 1996-1997 an expert group meeting as a form of follow-up to its first ad hoc expert group meeting, held in 1994, on policies and strategies for the development of natural resources and energy in Africa. The expert group will re-examine the status of the African remote sensing programme with special attention to the constraints and obstacles that countries in the region may continue to confront in sharing the benefits of remote sensing and GIS.

132. ECA will organize in September and October 1996 the Ninth United Nations Regional Cartographic Conference for Africa, at Rabat (Morocco). Although its theme and agenda have not yet been defined, the Ninth Conference will deal with, among other issues, the following: strategies for regional cooperation in space application for sustainable development; the effects of new technologies and new resource information needs on the role and capabilities of mapping and remote sensing; and the contributing role of the private sector in mapping and remote sensing.

133. ESCAP will organize the following meetings:

(a) Meeting of the Directors of National Remote Sensing Centres/Programmes in the ESCAP region (Regional Working Group Meeting on Remote Sensing and GIS), in June 1996, to be hosted by Malaysia;

(b) Second session of the Intergovernmental Consultative Committee on the Regional Space Applications Programme for Sustainable Development in Asia and the Pacific, in June 1996, to be hosted by Malaysia;

(c) Expert Group Meeting on Small Satellite Data Applications in Asia and the Pacific, in 1996;

(d) Regional Working Group Meeting on Remote Sensing and GIS, in May 1997;

(e) Third session of the Intergovernmental Consultative Committee on the Regional Space Applications Programme for Sustainable Development in Asia and the Pacific, in May 1997;

(f) Meeting of Inter-Agency Task Subcommittee on Space Technology Applications for Sustainable Development in Asia and the Pacific in 1996 and 1997;

(g) Ad Hoc Expert Meeting on Policies for Integrating Space Technology Applications with Sustainable Development Planning, in February 1997.

134. UNESCO, within the framework of its Man and the Biosphere programme, will synthesize and publish its recent GIS case-studies for biosphere reserve management in developing countries. A task force for biosphere reserve data management will soon be established. This task force will elaborate strategies, tactics

and technical protocols for improving biosphere reserve data management, including the use of GIS and remote sensing, and will plan future activities.

4. Establishment of centres for space science and technology education

135. In response to General Assembly resolution 45/72 of 11 December 1990, the United Nations Programme on Space Applications continues to make progress in establishing regional centres for space science and technology education in developing countries, which are expected to enhance the academic and professional capabilities and technical infrastructure in space science and technology in each region.

136. In accordance with General Assembly resolution 50/27 of 6 December 1995, in which the Assembly endorsed the recommendation of the Committee on the Peaceful Uses of Outer Space that the centres should be established on the basis of affiliation with the United Nations, the following activities will be conducted within the framework of the Programme in 1996 and 1997:

(a) At the invitation of the centre for Asia and the Pacific, which was established in India on 1 November 1995, the United Nations will be represented in the governing board of the centre and will assist in implementing the first educational programme, which is scheduled to start in April 1996;

(b) In 1996, within the framework of the Programme, assistance will be provided to the Governments of Brazil and Mexico, for the establishment of the centre for Latin America and the Caribbean, as well as to the Governments of Morocco and Nigeria, for the establishment of centres for French-speaking and English-speaking countries in Africa, respectively;

(c) Negotiations are under way with parties interested in hosting the centre for western Asia.

137. A model curriculum is currently being developed in order to provide each regional centre for space science and technology education with a benchmark of the academic level necessary for international recognition. The initial work on that model curriculum was conducted at the Meeting of Experts on the Development of Education Curricula, which was organized and hosted by the Government of Spain and held at Granada, Spain, in February and March 1995. The model curriculum which emanated from that Meeting is currently undergoing peer review and will be finalized in due course for distribution in 1996.

138. ECA will continue to support the initiative of the Office for Outer Space Affairs to establish a regional centre for space science and technology education in Africa as a necessary step for the creation of endogenous technical capacity and as a complement to the training normally offered by such a regional centre.

5. Capacity building

139. The Department for Development Support and Management Services, through its multisectoral technical advisory services, as well as its programme and project support to Governments of developing countries and economies in transition, assists in strengthening national capabilities and creating a favourable environment for development. Its efforts are aimed at integrating new data sets into projects related to cartography, natural resource development and environmental monitoring.

140. EAP strives to complement the efforts of established organizations. Partnerships and efforts towards collaboration have commenced and are being formalized. The programme is active in Africa and in Asia and the Pacific and has commenced preparatory activities in newly independent States in central and eastern Europe and in Latin America and the Caribbean. The programme is conducted in close cooperation with UNDP, the Office to Combat Desertification and Drought and UNITAR and is developing closer ties with the regional information management activities of FAO and WMO.

141. In Africa, UNEP executes the following activities under its EAP and Environment and Natural Resource Information Networks (ENRIN):

(a) In partnership with SADC and the Environment and Land Management Sector (ELMS), UNEP has continued to move towards establishing a subregional environmental and natural resource information network for the ELMS unit and the 11 SADC member States. UNEP, SADC and Gesellschaft für Technische Zusammenarbeit jointly supported and commissioned an expert consultancy to assess the information management needs of the SADC network. The findings of the mission were presented to a formal meeting called by SADC and ELMS in September 1994. The meeting recommended the form of the final project proposal for submission to donors for financing (A/AC.105/551, para. 31). A follow-up meeting was held at Gaborone in June 1995 to review the institutional framework proposed by SADC and ELMS, to implement the programme and, in particular, to consider the priority issues that need to be addressed by the institutions selected to coordinate the following two programme components: networking, by the SADC food and security unit; and training and education, by the University of Botswana. Implementation of the two components was expected to commence in October 1995. UNEP will continue to cooperate with SADC in implementing follow-up activities in 1996 and beyond;

(b) Together with the Office to Combat Desertification and Drought and UNITAR, UNEP has discussed cooperation with IGADD to participate in information management activities and the establishment of network needs inventory for Eritrea and the United Republic of Tanzania. A preliminary agreement to collaborate with IGADD in the development of EIS in the region has been reached and a regional workshop to review the country needs assessment and to formulate a regional EIS support programme was held at Kampala from 25 to 27 August 1995. Follow-up activities to the workshop are likely to take place in the period 1996-1997;

(c) UNEP continues to provide backstopping assistance and services to maintain environment and natural resource information system capabilities established in Botswana, Burkina Faso, Côte d'Ivoire, Ghana, Kenya, Lesotho, Mozambique, Niger, Uganda, United Republic of Tanzania and Zambia, as part of the GEMS/UNITAR project;

(d) With the Permanent Inter-State Committee for Drought Control in the Sahel (CILSS) and Agrometeorology and Operational Hydrology and Their Applications (AGRHYMET), UNEP is attempting to re-establish a subregional technical support programme. At a CILSS Regional User Consultation Meeting held at Niamey in June 1995, UNEP was mandated to mobilize the necessary support for strengthening national and regional institutional capacities and infrastructure for environmental assessment and associated data and information management activities at the national and regional levels. As follow-up, UNEP is funding a country needs inventory for the CILSS region. A regional workshop to review the inventory and formulate a regional EIS support programme was scheduled to be held in December 1995. Activities under the programme are expected to take place in 1996 and beyond;

(e) UNEP continues to provide technical advice to Uganda, the United Republic of Tanzania and Zambia, which are developing national environment information networks of key institutions active in managing environmental and natural resources. Technical and advisory support is provided by UNEP to the following:

(i) The National Environment Information Centre of Uganda to conduct a detailed assessment of the level of EIS development in the country and the impact on decision makers;

(ii) The National Environment Management Council of the United Republic of Tanzania, in cooperation with the Office to Combat Desertification and Drought, to develop a one-year preparatory assistance proposal funded by the Office to establish a national environment information network;

(iii) Zambia, in cooperation with the Environmental Council of Zambia (ECZ), to establish a national environment information network for the country: the preparatory phase was completed in June 1994 and a three-year EIS investment programme to strengthen the capacity of ECZ for information and data management was scheduled to commence in late 1995; and ECZ has just completed a study to review the integration of EIS into national development planning processes in which it was recommended that the study should be incorporated into the proposed NEAP investment programmes and projects;

(iv) Ghana: a similar approach has been adopted by a number of environmental institutions, with the lead of the Environment Protection Agency, the National Development Planning Commission and the Remote Sensing Applications Unit; and a preparatory phase project to lay the foundation for strengthened nations EIS networking was scheduled for implementation in September 1995;

(v) Botswana: a similar proposal is under review by national institutions;

(f) UNEP is undertaking activities to support a UNDP/Global Environment Facility regional biodiversity project for Kenya, Uganda and the United Republic of Tanzania, which is being executed by FAO, for the development and strengthening of the national database capabilities component of the project.

142. In Asia and the Pacific, the activities under EAP and ENRIN include the following:

(a) UNEP implementation of the Environment Assessment Programme for Asia and the Pacific consists of three components: assessment and reporting; data management; and institutional capacity building and servicing. Memoranda of understanding and agreements to cooperate have been reached with the following five subregional organizations in the region: ASEAN, International Centre for Integrated Mountain Development, Mekong River Commission, South Asia Co-operative Environment Programme and South Pacific Regional Environment Programme;

(b) Under the assessment and reporting component, UNEP is assisting Governments and the subregional partner institutions in the preparation of national and subregional reports on the state of the environment. The reports of the four subregions were targeted to be completed by December 1995. These include the reports for the ASEAN subregion; the greater Mekong subregion, comprising Cambodia, China, Lao People's Democratic Republic, Myanmar, Thailand and Viet Nam; south Asia; and south Pacific;

(c) UNEP provides database development and data management support to the 1995 regional report on the state of the environment implemented by ESCAP on behalf of the countries in the region. The database is being initially disseminated to 16 targeted countries for completion and updating. UNEP is developing closer relationships particularly in the new phase of the UNDP/ESCAP Regional Remote Sensing Programme, with its new focus on the integration of remote sensing and GIS;

(d) Under the data management component, UNEP is developing core data sets of both bio-physical and socio-economic data at various levels. These include data sets on the scale 1:1,000,000 at the regional level, on the scale 1:250,000 at the subregional level and on the scale 1:100,000 or 1:50,000 at the national/urban levels;

(e) UNEP is archiving and maintaining a 20 gigabyte in-house database and disseminating subsets of data on request to interested individuals and institutions. A biannual catalog of data holdings of subregional partners and its Environment Assessment Programme for Asia and the Pacific, which is located at AIT at Bangkok, is prepared and updated every January and July;

(f) Under the capacity-building and servicing component, UNEP is currently providing assistance to 16 countries in the region through the following:

(i) Technology transfer training and provision of hardware and software to Bangladesh, Bhutan, Cambodia, China, Fiji, India, Indonesia, Lao People's Democratic Republic, Maldives, Myanmar, Nepal, Pakistan, Samoa, Sri Lanka, Thailand and Viet Nam;

(ii) Development of a decentralized national network of distributed environment information systems in each of the 16 countries with the environment and/or planning agency acting as the focal point;

(iii) Establishment of a GIS application centre, a regional training facility, at AIT;

(iv) Establishment of subregional training facilities at the Environmental Research and Training Centre at Bangkok; at Tribhuvan University at Kathmandu; and at the University of the South Pacific at Suva;

(v) Establishment of national training facilities at Dr. Y. S. Parmar University of Horticulture and Forestry at Solan, India; at Jahangirnagar University at Dhaka; and at the University of Peradeniya at Colombo;

(g) UNEP is developing a regional directory of environment institutions, experts and data, listed by country;

(h) UNEP is seeking the support of other donor programmes to undertake complementary and/or joint activities. Sound relationships have been established in the region with UNDP and the Asian Development Bank. Gesellschaft für Technische Zusammenarbeit, the Danish International Development Agency and the Finnish International Development Agency (FINNIDA) are making significant contributions to environment information capacity development at the national level;

(i) UNEP is undertaking collaborative activities with other entities, including the Statistics Division of ESCAP, the UNEP regional office for Asia and the Pacific, the Asian Disaster Preparedness Centre, the International Union for Conservation of Nature and Natural Resources, the International Rice Research Institute, the Consultative Group on International Agricultural Research and the International Crop Research Institute for the Semi-Arid Tropics;

(j) UNEP is providing technical assistance for an integrated information system in Anhui Province of China, in collaboration with the UNDP office at Beijing.

143. In the newly independent States in central and eastern Europe, UNEP, through its EAP and ENRIN and its GRID facility at Arendal, has commenced activities to assess the current and future capacity-building needs for spatial data and information management. The objective is to develop a network among governmental and associated agencies and institutions responsible for the implementation of, or contribution to, national and international environment assessments and reporting. UNEP is closely cooperating with other international organizations with related programmes in the region, such as WHO and the European Environment Agency. This work will continue through 1997.

144. EAP and ENRIN, in the region of Latin America and the Caribbean, will continue in 1996 and beyond to implement a project initiated in 1994 to ascertain the regional priorities for environmental assessment. UNEP has associated spatial database needs for Latin America and the Caribbean to support the development of proposals for capacity-building projects related to the environment and natural resource information management.

145. ESCAP will assist its member States in establishing an Earth space information network in Asia and the Pacific (ESINAP) to promote the sharing of Earth observation data for sustainable development planning. Following a pre-feasibility study carried out in early 1995 and a feasibility study to be completed by February 1997, a prototype ESINAP system will be developed with the participation of eight ESCAP member States and an operational test on the system using Internet as a backbone will be carried out in the second half of 1996.

146. ESCAP will undertake technical advisory service and consultancy missions in its member States on the applications of GIS and remote sensing in integrated natural resources and environment management in 1996 and 1997. Those missions will assist in (a) promoting space technology applications for sustainable development, with emphasis on policy issues and institutional building; and (b) strengthening national capabilities in space applications or development with special emphasis on remote sensing and related GIS applications.

147. FAO, through its AFRICOVER project, contributes to strengthening African capacities in advance geographic information technologies on environment and natural resources. The value of the AFRICOVER project is not merely in the usefulness of the maps and databases to be produced; the elaboration of such maps will initiate efforts towards capacity building in the region of Africa through the development of national information systems on environment and natural resources, crop assessment and food security, land management and large watershed management, preparation of investment field projects and locust and desertification control (see paragraphs 97 and 98 above).

148. The main emphasis of the activities of FAO in the field of agricultural applications has been placed on the systematic enhancement of the national capacities of existing institutes whose mandate lies in implementing activities involving remote sensing, natural resource monitoring and mapping. The current tendency is to implement projects whose operational capacity has been vital to larger programmes. The following is a list of activities which will continue to be carried out in the period 1996-1997 for the above purposes:

(a) *Nile basin*: Through the effective development of an operational remote sensing capacity to receive Meteosat satellite imagery for the Blue and White Nile data, Meteosat derived rainfall information is calibrated and fed into forecasting models to provide up to three weeks' advance notice of river flow at critical points along the Blue Nile;

(b) *Egypt*: Egypt has been the focal point for two other important institution-building projects assisted by FAO. The first project is located at the Desert Research Centre, which now has the capacity to monitor the delicate ecological balance of Egyptian rangelands. The Centre will also supply data to the Observatoire du Sahara et du Sahel programme. The second project is located at the Soil and Water Research Institute of the Ministry of Agriculture. As a result of the significant strengthening of its remote sensing capacity, the Institute has expanded monitoring of renewable natural resources in Egypt. Remote sensing is also used for operational soil mapping within the delta, and regular crop acreage estimates are made for the major crops each season. The Institute has also attracted a considerable amount of additional resources on a bilateral basis from Canada and France to further enhance its mapping and agricultural statistics reporting capacity;

(c) *Côte d'Ivoire*: FAO is assisting in the establishment of a Remote Sensing Laboratory at the Institute for Tropical Geography, University of Abidjan. FAO is also involved in the preparation of an environmental information system with UNDP;

(d) *Afghanistan*: A project for land-cover inventory on the scales 1:100,000 and 1:250,000, based on satellite remote sensing, is being implemented. It will provide the basis for assessing the change in area cultivated or lost during the 13 years of war. The historical perspective of land-use changes has been

provided from existing maps and photographs which have been digitized and will be compared with the current situation. All these documents will be used for land-use policy planning.

149. In order to improve availability of current information on vegetation cover and land use in Africa, FAO has formulated a project proposal for a Land Cover Map and Digital Database of Africa. This proposal, which was endorsed by the United Nations Inter-Agency Meeting on Outer Space Activities, is now being submitted by African countries to potential donors (see paragraphs 97 and 98 above).

150. FAO should retain the capability to play an active role in building the capacity of and strengthening national and regional bodies, especially in developing countries, through:

(a) Training for decision makers and project managers;

(b) Support to national and regional centres (consultancy for equipment, maintenance, organization, training courses for technical staff);

(c) Technology transfer from headquarters to countries and regions (early warning systems, projects, pilot action studies).

151. UNITAR contributes to national and regional capacity building for sustainable development through its various activities related to environmental management with the use of space technology, as well as new information and ground communication technologies. Those activities include training programmes, pilot projects and dissemination of information. The following four major UNITAR programmes particularly concern the development of new information and communication technologies and the transfer of those technologies to the developing countries: (a) the AFRICAGIS programme, which is carried out jointly with the Observatoire du Sahara et du Sahel; (b) the space information systems programme on climate change; (c) the InterAfrique programme for the development of communication and information networks in Africa; and (d) the environmental modelling programme.

152. The joint AFRICAGIS programme has, through the following activities, established a working framework and paved the way for the establishment and operation of integrated information systems on the environment in Africa, both at the thematic level and at the institutional level:

(a) At the thematic level, the need to intensify methodological study has been identified, in order to have recognized standards, harmonized databases and efficient means of communications. In this regard, the following activities will be carried out for the period 1996-1997:

(i) Establishment of an information system on desertification in Africa, in cooperation with the World Resources Institute and CNES of France. In this context, the Observatoire du Sahara et du Sahel and UNITAR are establishing an international group of experts on the standardization of geographic information in Africa;

(ii) Preparation of training material in 1996, within the framework of the United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, particularly in Africa (A/49/84/Add.2, annex, appendix II), on new technologies to compile, manage and analyse information on desertification phenomena and organization of two or three regional training seminars on the Integrated Environmental Information System (IEIS);

(iii) Provision of a training programme, in connection with the introduction of national policies on geographic information, involving all the national parties, in order to build a standard national database. The database would be duplicated in the various ministries and technical

centres and would permit coordinated and rational planning at the State level as well as at the sectoral level within those bodies. The purpose of such a programme will be to assist State services in establishing a national policy for numerical cartography, which is indispensable for the efficient management of natural resources. Activities of the initial phase of the programme are ongoing or will be carried out with Côte d'Ivoire and the United Republic of Tanzania, in cooperation with UNEP, its GEMS programme and the Office to Combat Desertification and Drought, and with Ethiopia and Nigeria, in cooperation with the Office to Combat Desertification and Drought and the AGRHYMET programme.

(b) At the institutional level, a mechanism has been established for information exchange and coordination between technical centres and universities of the South and the North and bilateral and multilateral financing partners. This mechanism consists of the following activities:

(i) Organization of biennial meetings of the pan-African conference on IEIS (AFRICAGIS '93, held at Tunis in 1993; AFRICAGIS '95, held at Abidjan in 1995; and AFRICAGIS '97, to be held at Gaborone in 1997);

(ii) AFRICAGIS@RIO.ORG, an electronic forum in which more than 500 members receive information bulletins on GIS and remote sensing on a regular basis and exchange various information;

(iii) Circulation of the *AFRICAGIS News* bulletin three times a year;

(iv) Maintenance of an inventory of GIS applications in Africa;

(v) Technological monitoring of GIS software.

153. Within the framework of the joint CC:TRAIN programme of UNITAR and the secretariat of the United Nations Framework Convention on Climate Change (A/AC.237/18 (Part II)/Add.1), a training programme on space information systems for climate change has started. This programme is aimed at assisting States in building technical and institutional capacities to establish national mechanisms for the operation of space information systems. Such mechanisms would involve decision makers who need data on climate change as a basis for making relevant policies. They would also involve the scientific and technical community, which has new information and communication technologies available for the compilation, management and analysis of data on climate change.

154. UNITAR will start the first two-year phase of the InterAfrique programme at the end of 1995 in cooperation with ORSTOM and the Observatoire du Sahara et du Sahel. The programme concerns decision makers, managers of research and development programmes and the African scientific and technical community and is aimed at increasing their awareness of the opportunities and challenges of information and communication networks. The programme is also aimed at training them in the utilization of such networks. In this regard, the programme will:

(a) Offer tools for communication between technical and institutional partners working on national and international programmes concerning the environment, as well as scientific and technical research;

(b) Promote access by those partners in Africa to the Internet forums in order to better integrate the African community into international research and development efforts through their direct involvement in multilateral programmes and projects;

(c) Reinforce the African capacity for electronic communication on subjects of sectoral interest (e.g. agriculture, forestry, water resources, meteorology and climatology) and of global interest (e.g. economics and environment);

(d) Provide assistance to and involve in the implementation of the programme partners in related fields who have developed or are developing skills related to communication, local enterprises whose practical knowledge and technique on communication have been tested and confirmed, and training and research establishments that constitute regional or national centres of excellence.

155. The environmental modelling programme has developed a methodology that identifies ways and means of streamlining key organizations involved in national and regional development planning. Through case-studies, this programme attempts to identify what policy could best reduce the negative impact of land degradation and subsequent damages on biological potential. The programme proposes a series of generic means to understand structural changes in the way people earn their living, as well as various economic aspects of social life. Such information is utilized to examine possible changes in land status and to produce graphic materials to be used by decision makers and scientists trained by UNITAR. This programme is directed mainly at the Latin American and Caribbean region.

156. In addition to the above major programmes, UNITAR will continue to publish in the period 1996-1997 a series of training manuals on EIS. The current series of UNITAR educational publications started in 1991 under the general title "Exploration in the Technology of Geographic Information Systems". The series comprises manuals designed to assist those involved in natural resources and environment management in learning analytical techniques and the principal applications of GIS technology. The manuals have been prepared to meet the needs of UNITAR trainees and provide descriptions, guidelines and scientific literature on various related issues, as well as exercises and case-studies for practical use with specially prepared software and diskettes accompanying each volume. This series of UNITAR manuals has been developed in cooperation with recognized scientists and academic and government institutions throughout the world. Each volume is subject to practical tests before publication and distribution. Five volumes have been published since 1991 under the titles *Change and Time Series Analysis*, *GIS Application in Forestry*, *GIS Application in Coastal Zone Management*, *GIS and Decision-Making* and *GIS Applications in Mountain Environments*. Other volumes, entitled "GIS applications in hazards and risk assessment" and "GIS application in urban areas in developing countries", are currently under preparation.[3] The publications will appear for the first time in French under the general title "Techniques et acquisitions des données et du traitement de l'information géographique". Other manuals are also being prepared.

B. Communications and navigation

1. Education and training programmes

Training courses, workshops and seminars

157. ICAO conducts activities to face new challenges concerning human resources involved in the introduction of advanced satellite-based communications, navigation and surveillance and air traffic management (CNS/ATM). In order to ensure that the system design and operating procedures take into account human performance and limitation, ICAO published a circular entitled "Human factors in CNS/ATM systems" (Circ. 249), which defines a philosophy of human-centred automation and provides the user with a practical template against which the human factors issues can be measured during acquisition and implementation of CNS/ATM-related technology. ICAO also recognizes that an adequate number of people should be trained or retrained in the use of new technologies. In this connection, ICAO addresses human resource planning and training issues through its TRAINAIR programme, which provides a mechanism for cooperation among training centres for the development of the many new training courses which are required.

158. The ITU Radiocommunication Bureau will be organizing seminars every two years and regional seminars in the intervening years on frequency management and the use of the geostationary-satellite orbit, with a view to providing technical assistance to the participating countries.

159. ITU will organize the World Telecommunication Policy Forum to discuss and exchange views and information on broad telecommunication policy issues, technological advances, infrastructure development and financial business considerations. The first meeting of the new Forum will take place from 21 to 23 October 1996 and will consider Global Mobile Personal Communication systems.

Fellowships

160. Through the United Nations Programme on Space Applications, ESA provides fellowship support for candidates from developing countries for in-depth training in the area of antenna propagation and satellite communications systems.

2. Expert services and survey missions to identify specific areas of applications relevant to a given country or group of countries and to carry out specific studies on pilot projects or to implement the projects with operational applications of technology

Provision of expert services and survey missions

161. The United Nations Programme on Space Applications will continue to provide support to the Asia-Pacific Satellite Communications Council, which was established as a conference in October 1994 and became a council in 1995. The Council will serve as a regional forum for promoting exchanges of information and cooperation in the field of satellite communications and broadcasting.

162. UNESCO, as a member of the Inter-Agency Consultative Committee, is acting in an advisory capacity and is providing assistance to the RASCOM project.

163. Activities of ITU in the area of satellite communications include the following:

(a) The ITU Telecommunications Development Bureau (BDT) will continue to provide, at the request of administrations of member States that are developing countries, experts to participate in satellite Earth station projects and in the planning of regional or domestic satellite communication systems. Documents prepared by BDT, such as telecommunication development plans, master plans or sectoral studies, usually include a satellite communications component;

(b) Administrations of member States will continue to be kept regularly informed, through the Radiocommunication Bureau weekly circular and the special sections annexed thereto, of frequency assignments and orbital positions communicated to the Bureau in space radiocommunication services. The Bureau also responds to requests for advice from administrations on specific topics and provides information and documents, mainly in relation to space radiocommunication services.

Study, pilot projects and operational applications

164. The United Nations Programme on Space Applications will continue to make its efforts towards the implementation of the Cooperative Information Network Linking Scientists, Educators and Professionals in Africa (COPINE) project, which focuses on the implementation of a satellite-based information system. COPINE is aimed at improving the collection, transmission, distribution and exchange of information particularly in such areas as health care, agricultural research and development, management of natural

resources and the environment, education and science and technology through, for example, computer file transfer, interactive data transfer, document transmission and imagery and video transmission, to facilitate video conferences, distant teaching and telemedicine.

165. The Governing Council of UNEP at its eighteenth session approved the implementation of the satellite-based telecommunications system known as Mercure. This system consists of a suite of 16 International Telecommunications Satellite Organization (INTELSAT) Earth stations in a dual configuration of eight high-capacity stations (with video conference capability) and eight lower-capacity stations for limited service in less developed telecommunications locations. The Mercure project is now under implementation, and the eight high-capacity stations, which will function as the backbone of the system, are currently under construction. The locations of the stations are as follows: Geneva (Geneva Executive Centre, UNEP Regional Office for Europe), Nairobi (UNEP headquarters), Mexico City (UNEP Regional Office for Latin America and the Caribbean), Bangkok (UNEP Regional Office for Asia and the Pacific), Moscow (Federal Centre of Geoecological Systems, Ministry of the Environment of the Russian Federation) and Beijing (National Environmental Protection Agency, Ministry of the Environment of China). The installation and preparation were initiated in the third quarter of 1995; the installations are expected to be completed as of the fourth quarter of 1996. In the deployment of the satellite communication earth stations, UNEP works closely with its regional bodies to ensure that, in accordance with its policy to extend its service to the regions, the system will be utilized in the best possible way.

166. UNEP will continue to operate the Direct Information Access Network for Africa (DIANA) data communications system between FAO at Rome and RCSSMRS at Nairobi, the Department of Meteorology at Harare and the FAO Regional Office for Africa at Accra. The system complements operational early warning systems for food security in eastern and southern Africa by providing fast and efficient data distribution capacity for environmental satellite data produced by the ARTEMIS system of FAO at Rome. Negotiations are in progress to identify a funding source to ensure the continued operation of the system beyond 1995. The DIANA system will possibly be upgraded and integrated with the Mercure network after the latter is implemented.

167. ESCAP will implement a project on the study of satellite communication applications for distant education in Asia and the Pacific. In this connection, an expert group meeting will be organized to identify issues and prioritize areas for regional cooperation in 1996. A pilot project on distant education using communication satellite technology will be developed for implementation in a select group of ESCAP member States through this study.

168. FAO, in cooperation with ESA, in 1992 started testing the DIANA satellite communication system, developed under ESA management. The system is at present at the demonstration stage. Although its cost cannot be justified by the FAO remote sensing telecommunications requirements alone, it may develop into a multi-purpose, multi-user satellite telecommunications system in future. Such a development would significantly strengthen communication links between Africa and Europe.

169. UNESCO is continuing to examine different ways and means of making wider use of low and geostationary-orbit satellite systems for communication, information, informatics, education, science, culture and environmental protection in the implementation of programmes and projects such as the following:

(a) Within the framework of the recovery plan of the Pan-African News Agency, a satellite communication network for the exchange of information will be established by linking most of the national agencies in Africa. These activities are conducted in close cooperation with United Nations specialized agencies, national and regional space institutions and non-governmental organizations, as well as interested member States;

(b) Within the framework of the International Commission on Education for the Twenty-First Century (Delors Commission), UNESCO will continue to assess, evaluate and study the experience achieved in distance education, as well as the impact of new communication and information technologies, in particular, communication satellites applicable to distance education.

170. Within the framework of the UNESCO initiative "Learning without Frontiers", which fosters lifelong education for all at all levels, a joint ITU/UNESCO pilot project on education application of interactive television will be implemented. The project, which supports the teaching of primary teachers in developing countries, consists of upgrading ordinary television sets to enable the viewer to communicate by voice and data channel with the broadcast site. UNESCO will be responsible for the conceptual aspects and educational content, while ITU, which is developing the standards, will take primary responsibility for the technical implementation.

171. ITU will continue to contribute in this sphere through the following activities:

(a) In the light of technological development, ITU radiocommunication study groups 1, 3, 4, 7, 8, 10 and 11 will pursue studies on technology and spectrum/orbit utilization for space communications. The radiocommunication study groups are part of the ITU Radiocommunication Sector, which is responsible for studying technical, operational and regulatory/procedural questions on radiocommunication, issuing recommendations and preparing the technical basis for radiocommunication assemblies and world radiocommunication conferences;

(b) The Telecommunication Standardization Bureau of ITU will continue its work on a study programme concerning the application of space technology in different services, including aeronautical mobile, maritime mobile and land mobile services, telecommunication services to remote regions and weather forecasts. The Bureau will also continue its work on the integration of satellite systems into the general telecommunication network. Many study groups of the Telecommunication Standardization Sector and the Radiocommunication Sector of ITU contribute to this work by developing recommendations and drawing up specifications. The sectors also prepare recommendations in order to ensure continuing and full integration of the satellite transmission medium in public digital networks, including the integrated services digital network, taking into account emerging technologies, applications and services;

(c) Following the decisions of the World Telecommunication Standardization Conference, held at Helsinki in 1993, an intersectoral coordination group has been established between the Telecommunication Standardization Sector and the Radiocommunication Sector of ITU with a view to coordinating the direction of studies on future public land mobile telecommunication systems in particular relating to their satellite component. A draft recommendation on network functions for those systems, to serve as basis for developing the signalling interfaces to support their services, is being finalized;

(d) The above intersectoral coordination group will also coordinate the review of recommendations on satellite matters prepared in both sectors;

(e) BDT continues its work to implement the Buenos Aires Action Plan for the Global Development of Telecommunications, which was adopted by the first World Telecommunication Development Conference, held at Buenos Aires in March 1994. The implementation of the Action Plan will enable the agreed goals and objectives to be reflected in a concrete work programme for the period 1994-1998 and will make telecommunications a principal factor contributing to sustainable development. The Action Plan comprises the following three parts: a programme of cooperation among the members of the Telecommunication Development Sector of ITU; a BDT plan of action for assisting developing countries; and a special programme for the least developed countries. The second part of the Action Plan consists of 12 programmes, including programmes on policies, strategies and financing; human resource management and development; frequency management; integrated rural development; and broadcasting infrastructure. Satellite

communications are an integral part of those programmes. The Action Plan mainly refers to coordinated regional and global activities. It is expected that those activities will be complimented by multilateral and bilateral projects executed or supported by ITU and its development partners;

(f) Within the scope of the Buenos Aires Action Plan, which listed as a priority item the need to increase the accessibility of telecommunication services in rural and remote areas in developing countries, ITU launched in 1994 an interregional project called Space Communications Technology Applications (SPACECOM) for developing countries. The project was designed by BDT, in association with industry. The project seeks to promote the broad applications of space communications technology in developing countries, which would greatly contribute to the development of the countries concerned and the satellite communication industry by forging a strong partnership between the space communications industry and the telecommunication operator and user community in developing countries.

172. Although the involvement of ITU in the RASCOM project formally terminated in December 1993, ITU is following its activities and coordinating with the Pan-African Telecommunications Network (PANAFTEL), since the two systems (satellite and terrestrial) are complementary (A/AC.105/551, paras. 151 and 152). In particular, rural and remote areas will have to be linked to the networks through either of the above systems.

173. WIPO will continue to study various questions related to the use of broadcasting satellites in the field of copyright and neighbouring rights in the context of the committee of experts on a possible protocol to the Berne Convention. Those questions include the digital broadcasting, the encryption of broadcast signals, the technical security means, and the ownership of rights between the country of emission of the signal and the country or countries of reception ("footprint" countries).

3. Dissemination or exchange of information on the status of technology or operational systems through meetings or publications

Dissemination of technological information

174. UNEP is promoting modern telecommunication methods, including satellite-based telecommunications for the exchange of electronic messages and dissemination of environmental information. Mercure will be the hub of these initiatives beginning in 1996, but in the interim, a network of computer bulletin board systems links UNEP regional offices with its headquarters at Nairobi. Additionally, the International Environment System Information (INFOTERRA) has published a subscription list for environmental queries and opened a fully fledged Gopher node on the Internet.

175. The UNEP International Cleaner Production Information Clearing-house, one of the activities under the Cleaner Production Programme, continues to provide an on-line computerized information exchange service to promote the concept of cleaner production on a global scale. Other Cleaner Production Programme activities include: training and technical assistance, in which UNEP Industry and Energy assists Governments, industry and academia in the preparation and presentation of workshops and seminars at their request; publications, which help the dissemination of information and exchange of experiences; and organization of working groups, which collect and disseminate information and provide input to the direction of the Programme.

176. ITU will continue to contribute in this sphere through the following activities:

(a) Its Radiocommunication Bureau periodically publishes approved recommendations, either new or revised, on space radiocommunications. Publications of special interest for space radiocommunications concern issues on space applications; fixed service using communications satellites; mobile-satellite, radiodetermination-satellite, amateur-satellite and broadcasting-satellite (sound and television) services; satellite news gathering; frequency sharing; and compatibility of different services. They form the basis for

harmonious technical development of space radiocommunication systems and contain criteria for the sharing of frequency bands between the various space services, as well as between space and terrestrial systems;

(b) The third edition of the ITU *Handbook on Satellite Communications (Fixed-Satellite Service) and the Handbook on the Mobile-Satellite Service* are under preparation;

(c) ITU publishes in its *Newsletter* at regular intervals (10 times a year) a list of launched satellites, together with their technical characteristics and orbital parameters. Once a year, a complete table of launched satellites is published;

(d) ITU also publishes annually the *Report on Telecommunication and the Peaceful Uses of Outer Space*, covering the activities carried out in this field by both the ITU secretariat and the administrations of member States;

(e) ITU organizes the quadrennial World Telecommunication Exhibition and Forum (TELECOM), as well as similar regional events in Africa, the Americas and Asia. Preparations are now under way for Americas TELECOM-96, which will be held at Rio de Janeiro, Brazil, from 10 to 15 June 1996. The Forum will comprise a Strategy and Technology Summit, and the main theme will be "Telecommunications and Sustainable Development - From Potential to Growth";

(f) The Radiocommunication Bureau publishes quarterly an updated list of orbital positions and associated frequency bands for space stations on board geostationary satellite and non-geostationary space systems. In a more detailed form, it publishes all the technical characteristics of satellite networks submitted to it under the coordination or notification procedures, for recording in the Master International Frequency Register.

4. Regulation of the use of the geostationary satellite orbit and the radio-frequency spectrum allocated to space communication services

177. The 1995 World Radiocommunication Conference, which took place at Geneva from 23 October to 17 November 1995, adopted the following:

(a) Regulatory and technical procedures to facilitate the use of frequency bands below 3 GHz allocated to the mobile satellite service as follow-up to decisions of the World Administrative Radio Conference held in 1992;

(b) Additional frequency allocations to the mobile satellite service;

(c) Simplified Radio Regulations;

(d) Preliminary agenda for the 1997 World Radio Conference, the main task of which will be to review the plan for the Broadcasting Satellite Service and the plan for feeder links in regions 1 and 2. The main decisions of the 1995 World Radiocommunication Conference and the simplified Radio Regulations will come into force on 1 January 1997 and in 1998, respectively.

178. The preparatory meeting for the 1997 Conference, which has been established to carry out the necessary preparatory work for the Conference, will continue its task. The ITU Radiocommunication Sector study groups are conducting studies in the field of space radiocommunications concerning technical aspects of mobile-satellite, fixed-satellite, Earth-exploration satellite, meteorological satellite, space research, space operation and broadcasting-satellite services and low-orbit satellite systems. The report to the 1997 Conference will be prepared by the preparatory meeting in order to assist the ITU members who will be involved in the deliberations of the Conference.

179. Technological progress, politico-social structural changes around the world and their impact on the liberalization of telecommunication services, the introduction of non-geostationary satellite systems for commercial communications and other elements prompted the plenipotentiary conference of ITU, held at Kyoto, Japan, in 1994, to call for, in its resolution 18, a new in-depth review of the ITU spectrum/orbit resource allocation procedures. The review is being undertaken by the Radiocommunication Bureau of ITU. A preliminary report was submitted to the 1995 World Radiocommunication Conference. A final report summarizing the results of studies by different organs of ITU will be presented to the 1997 Conference with a view to deciding on ways of incorporating new procedures and mechanisms into the ITU legal regime in order to increase efficiency and equity in spectrum/orbit utilization.

5. Studies on and/or preparations for the establishment of new legal frameworks or the development of new systems to complement the existing legal frameworks

180. UNESCO will continue its activities which encourage further ratification or acceptance of the Convention Relating to the Distribution of Programme-Carrying Signals Transmitted by Satellite,[4] adopted at Brussels in 1974. Where relevant, the copyright and neighbouring rights problems raised by the use of different types of satellites for broadcasting purposes shall be dealt with within the framework of UNESCO studies on the impact of electronic technology, in particular digital, on the creation and dissemination of protected materials

181. As follow-up to the joint ITU/UNESCO study "The right to communicate at what price?", published in 1995, a pilot project on access to telematics facilities is being implemented in the Caribbean in collaboration with ITU, the Caribbean Telecommunications Union, the International Council for Scientific and Technical Information and the Pan American Health Organization. Two symposia on telematics for development, similar to the one organized in Ethiopia in April 1995 in cooperation with ECA, ITU and the International Development Research Centre, are to be held in Latin America and the Caribbean, as well as in the Arab States. The aim of the above-mentioned activities is to strengthen the relationship among service providers, telecommunications operators and end users in sectors of public concern in order to improve access to telematics facilities.

182. ICAO is continuing its action towards the implementation of CNS/ATM systems, which are largely based on satellite technology. The CNS/ATM Implementation Committee, created on 27 February 1995, reports directly to the ICAO Council. In 1996 and beyond, it will, *inter alia*, review progress on the implementation of the CNS/ATM global plan, as well as the CNS/ATM implementation plans of States, international organizations, airlines and industry, and make proposals to the ICAO Council with a view to facilitating the worldwide implementation of CNS/ATM.

183. ICAO has given its Legal Committee the task of considering with regard to the Global Navigation Satellite System (GNSS) the establishment of a legal framework. In accordance with the agreement of the ICAO Council, the Legal Committee will consider in 1996 and beyond specific issues, including: (a) definition of internationally acceptable institutional arrangements; (b) possible role of ICAO in the long-term provision of GNSS; (c) content of the arrangements to be entered into between ICAO and the States providing the present GNSS; and (d) compliance of GNSS providers with the relevant ICAO standards and recommended practices (see paragraphs 186-190 below).

184. WIPO will continue to study the changes brought about by new and emerging technologies, notably by digital technology, on copyright and neighbouring rights. Following worldwide symposia in 1993 and 1994 on related issues (A/AC.105/587, para. 199), WIPO organized a World Symposium on Copyright in the Global Information Infrastructure at Mexico City from 22 to 24 May 1995. A World Forum on the Protection of Intellectual Creations in the Information Society took place at Naples, Italy, from 18 to 20 October 1995. Such activities should continue in 1996 and 1997.

185. WIPO is also proposing new international norms in the fields of industrial property, copyright and neighbouring rights. WIPO has recently set up an arbitration system for disputes between private parties and is finalizing work on a treaty on the settlement of intellectual property disputes between States, which could be ready in 1996. The question of the enforcement of intellectual property rights in outer space could perhaps be discussed in those contexts.

6. Land, maritime and aeronautical mobile satellite services

186. IMO has undertaken studies on a worldwide radio-navigation system and has adopted a policy for recognition and acceptance of such systems (IMO resolution A.666(16)). GPS and GLONASS, which are candidate systems, are expected to be available for consideration and acceptance in the period 1995-1996. When either of these two or any other such system becomes operational, amendments to the 1974 International Convention for the Safety of Life at Sea will be considered, taking into account the above-mentioned policy.

187. As the operational availability of GPS has been guaranteed by the United States only until 2005 and GLONASS by the Russian Federation until 2010, IMO is considering the need and seeking the means to develop plans for a post-GPS/GLONASS system, internationally controlled civil GNSS in cooperation with ICAO and other user organizations.

188. At the ICAO Special Communications/Operations Divisional Meeting held in 1995, the Government of the United States reiterated its offer of the GPS standard positioning service for use by the international aviation community. It is the intention of the United States that such a service be a complementary component of the future GNSS, as envisaged by ICAO. The Government of the Russian Federation confirmed a similar offer for GLONASS, consisting of 24 operational navigation satellites. To allow States and operators to realize early the benefits of these existing satellite-based navigation systems, ICAO has developed and circulated to States and selected international organizations a draft version of a document entitled "Guidelines for the introduction of the Global Navigation Satellite Systems (GNSS)", which will be finalized in 1996.

189. At the above-mentioned meeting, ICAO contracting States recommended a global strategy for the implementation of all weather non-visual approach and landing operations for the next 20 years. The strategy includes considerations on the validations of the use of GNSS, with such augmentations as required, to support approach and departure operations, including category I operations. States are encouraged to implement GNSS for such operations as appropriate and to complete feasibility studies for category I and II operations, based on GNSS technology. With respect to space-based aeronautical communications, in 1995 ICAO adopted and included in annex 10 to the Convention on International Civil Aviation,[5] detailed technical standards for communications in the Aeronautical Mobile Satellite Service.

190. ICAO and IMO have initiated cooperation for the multi-modal use of GNSS in order to ensure that the service provided by the system will meet the needs of maritime users as well as the aviation community.

C. Meteorology and hydrology

1. Education and training programmes

Training courses, workshops and seminars

191. UNESCO will continue to support the following postgraduate training programmes:

(a) The Training and Education in Marine Science programme released in 1995 its fifth computer-based learning module, on applications of marine and coastal image data from satellite, airborne and *in situ*

sensors, concluding the first phase of a project which started 10 years ago. The first module with lessons in the Windows version of the BILKO image-processing software is scheduled for early 1996. Future modules will focus on coastal regions and, in particular, on small islands;

(b) IOC will continue to organize, in 1996 and beyond, regional training courses on the applications of remote sensing data to marine studies using the above-mentioned computer-based learning modules;

(c) UNESCO, in cooperation with ITC, will continue to organize in 1996 training courses on the use of remote sensing images and GIS in water research studies, within the framework of the International Hydrological Programme.

192. ESCAP is organizing the first meeting of a regional working group on meteorology satellite applications and disaster monitoring. The working group will establish its terms of reference and develop a self-sustainable regional cooperation mechanism for promoting broader uses of meteorology satellite data for sustainable development in the region of Asia and the Pacific.

193. FAO, in cooperation with ESA, will organize in Latin America in 1996 a workshop for decision makers on watershed management.

194. WMO plans to continue to collaborate with the United Nations, other organizations and WMO members in the co-sponsorship of training events during the period 1996-1997. The WMO proposals for satellite-related events for the biennium 1996-1997 include the seventh training course on tropical meteorology and tropical cyclone forecasting, to be held in 1996; the second southern hemisphere training course on tropical cyclones, to be held in 1996; and the fourth Regional Association workshop on hurricane forecasting and warning, to be held in 1997.

Fellowships

195. Through the United Nations Programme on Space Applications, ESA is providing fellowship support for the in-depth training of participants from developing countries in the area of satellite meteorology.

196. IOC provides grants annually, through the Training, Education and Mutual Assistance Programme, for short-term training which enables scientists from developing countries to participate in marine-related remote sensing training.

197. WMO grants fellowships under its Voluntary Cooperation Programme and its regular budget, as well as through UNDP and trust funds, for studies or training in meteorology and operational hydrology, including studies and training in satellite meteorology, interpretation of meteorological satellite photographs, satellite transmission systems and nephanalysis. In addition to fellows being trained at the WMO regional meteorological training centres, WMO members also provide training in numerical weather prediction products and interpretation of meteorological satellite data through fellowships offered by them under the Voluntary Cooperation Programme.

2. Expert services and survey missions to identify specific areas of applications relevant to a given country or group of countries and to carry out specific studies on pilot projects or to implement the projects with operational applications of technology

Provision of expert services and survey missions

198. The United Nations Programme on Space Applications will continue to provide technical advisory services to the Organisation for Indian Ocean Marine Affairs Co-operation (IOMAC) in the use of remote

sensing for monitoring and management of coastal resources, including the preparation of a project proposal for submission to the Global Environment Facility.

199. UNEP, through its GRID facility at Arendal, is assisting the International Northern Sea Route Programme in 1996 with a coastal environmental information system which permits scientists and decision makers to evaluate both operational and accidental transit impact on the coastal environment. The Programme has established over 50 research projects to evaluate the effects of increased commercial navigation through the Arctic north-east passage. The Programme links key institutions in Japan, Norway and the Russian Federation to sponsor research projects aimed at developing a knowledge base to help decision makers to evaluate the usability of the remote trade route. The GRID facility at Arendal is assisting the Programme in developing the coastal environmental information modelling system.

200. UNEP, through its GRID facility at Arendal, will continue to develop and refine a GIS database of the Baltic Sea catchment area. There is increasing awareness that the focus of the management of that hydroecological region needs to be shifted from the sea itself to the surrounding land areas if the aim is to improve the environmental status of the Baltic Sea. The main purpose of the project is to facilitate the management and analysis of the environment in the Baltic Sea drainage area by providing coherent spatial information related to environmental issues. To that end, a limited number of basic GIS data sets will be created and made available to interested users. The main geographical area to be covered by the project is the Baltic Sea drainage basin, although some data layers will extend beyond that area. Some cartographic data of the Baltic Sea itself have also been identified as desirable. The distribution policy for the data sets has yet to be determined in detail. However, the underlying idea is that all institutions and bodies involved in environmental issues of the region should have practically unlimited access to those data sets (in public domain). A considerable amount of the maps and data sets are available through the World Wide Web homepage of the GRID facility at Arendal.

201. UNEP and WMO will continue their work with the African Centre of Meteorological Applications for Development.

202. FAO is assisting in developing a Nile forecasting centre within the Ministry of Public Works and Water Resources at Cairo to monitor and forecast the flows of the Nile and its tributaries. The project, which is funded by the United States Agency for International Development (USAID), is designed to assist Egyptian planners in the more effective regulation of the Nile waters stored in Lake Nasser, with an integral part involving the real-time receipt and processing of environmental satellite data for precipitation estimation. The project is being carried out with the National Weather Service of NOAA of the United States as a subcontractor for the development of hydrological models.

203. The FAO Fisheries Department plans to install a satellite ground receiving station for NOAA-AVHRR local area coverage image data. The station will be used for satellite limnology, in support of the FAO/FINNIDA project entitled "Research for the management of fisheries on Lake Tanganyika".

Study, pilot projects and operational applications

204. UNEP will continue to participate in developing and supporting the programmes of GCOS secretariat in 1996 and beyond.

205. UNEP is cooperating with FAO, UNESCO, WMO and ICSU in supporting the planning process for GTOS. GTOS is envisaged as one of a number of global observing systems which will be complementary to each other and mutually supportive. It will provide the observational framework and data basis for (a) detection and understanding of the impact of regional and global changes on terrestrial and freshwater ecosystems; (b) evaluation of the impact and consequences of global changes on terrestrial ecosystems components and the environment; (c) forecasting, prediction and early warning of future terrestrial changes

and their impact; and (d) validation of global models of ecosystem processes and changes. An initial scientific proposal for GTOS is expected to be ready in 1996. The space observation component of GTOS will be addressed within that proposal.

206. UNEP is continuing its close cooperation with GOOS.

207. UNEP, through its Ocean and Coastal Areas Programme Activity Centre and its GRID facility at Nairobi, and with funding from the Government of Belgium, will continue to implement a programme to develop a marine and coastal zone database and atlas for eastern African countries in 1996 and beyond. The work is largely based on classifications derived from LANDSAT thematic mapper images.

208. FAO, within the framework of the ARTEMIS phase III project, will continue a major satellite rainfall estimation calibration programme, in cooperation with the University of Reading in the United Kingdom, and regional FAO projects in the IGADD and SADC regions. Under this programme, the ground-measured rainfall data from approximately 1,000 meteorological stations in Africa are systematically correlated with cold cloud duration data derived from the ARTEMIS hourly Meteosat observations. Meteosat-based quantitative rainfall estimates are obtained by linear regression. Their accuracy is expected to increase with extended duration of the calibration programme.

209. The Fishery Department of FAO conducts remote sensing activities for fisheries. Satellite remote sensing, in particular when combined with GIS, is increasingly being used in marine and inland fishery projects. FAO is developing GIS for the world ocean fisheries, resources and environment in 1996 and 1997. Pilot projects on the use of AVHRR data for inland fisheries are in progress.

210. UNESCO will continue its cooperation with FAO, the International Geosphere-Biosphere Programme of ICSU, UNEP and WMO in the development of GTOS, which will cover the broad question of monitoring biodiversity. Two activities within the UNESCO Man and the Biosphere programme are of special relevance: the International Network of Biosphere Reserves and the Diversitas Programme.

211. UNESCO and FAO will implement a joint programme to develop a GIS-based tool for the assessment of water resources on a continental scale.

212. IOC, in cooperation with the UNEP GRID facilities at Arendal and Nairobi, will continue to develop marine data information systems.

213. ITU Radiocommunication Study Group 7 will continue to study questions relating to the meteorological-satellite service and associated technologies throughout the next study period.

214. The application of satellite technology in meteorology and operational hydrology forms an important element of the technical cooperation activities of WMO. Those activities are generally undertaken with assistance from either the voluntary cooperation programmes of WMO or UNDP. The following activities are planned for 1996 and future years:

(a) *Africa*: A number of WMO members, including France, Germany, Italy, United Kingdom and United States, are donating data collection platforms to countries in Africa for the collection of meteorological data via the geostationary meteorological satellite Meteosat as well as Meteorological Data Distribution reception stations to improve the availability of observational data and processed information at national meteorological centres. Furthermore, eight satellite stations of the International Mobile Satellite Organization (Inmarsat) are to be installed in the countries that are members of CILSS with funding from USAID, in order to enhance data and products flow between the AGRHYMET regional centre at Niamey and national AGRHYMET centres. Some key stations in the Zambezi river basin will be equipped with data collection platforms using the Meteosat system for collecting data. A multi-donor project is now under preparation to

monitor desert locusts in Africa. Under the project, 50 automatic stations will be installed. In the Niger river basin, 64 data collection platforms using the Argos system have been operational for a number of years, and plans are being made to install more recent equipment. In collaboration with the World Bank, WMO has drawn up plans to set up in Africa an advanced hydrological and environmental monitoring system using Meteosat. About 100 stations will be installed on major rivers, costing between US$ 10 million and US$ 20 million over a period of five years;

(b) *Americas*: A plan for a new regional meteorological telecommunication network based on two-way multipoint telecommunication services via satellite was agreed upon and was to be operational in the second half of 1995, involving more than 20 countries. The plan is being implemented as part of a FINNIDA project for the Central American countries and through other international cooperation funding, mainly from the United States, for the Caribbean countries. The implementation of this plan will dramatically improve the meteorological telecommunication system in the region, including support for the Tropical Cyclone Programme;

(c) *Europe and newly independent States*: Some European countries such as Albania, Romania and Turkey have expressed a desire to establish and/or upgrade meteorological satellite receiving systems. The newly independent States and other new WMO members are planning to acquire satellite receiving stations to actively monitor the meteorological conditions. A plan for a new regional meteorological telecommunication network in Europe based on telecommunication services via satellite has been agreed upon and is being developed with a view to its implementation in the period 1996-1997. Installation of small satellite Earth stations in meteorological services will be pursued and strengthened, in particular for newly independent States, for the reception of meteorological information distributed by RETIM of France and FAX-E of Germany within the framework of regional meteorological telecommunications.

215. Within the framework of the WMO plan of action for the International Decade for National Disaster Reduction, a special project to upgrade the tropical cyclone warning system for the south-west Indian Ocean subregion has been established with financial assistance from the European Development Fund. The project is based on the application of meteorological satellite and microcomputer technology and on the transfer of scientific knowledge. The project will be continued in the period 1996-1997.

216. The overall long-term goals of the World Climate Research Programme (WCRP), jointly sponsored by WMO, ICSU and IOC, are to determine to what extent climate can be predicted and the extent of human influence on climate. Progress in this scientific programme on the successful continuation or new development of main space observing systems is described below:

(a) The scientific plan for WCRP gives high priority to understanding the effects of cloudiness on the radiation and energy budget. The International Satellite Cloud Climatology Project is producing long-term climatological records of global cloud amount and properties, as well as radiation flux data from the international array of geostationary meteorological satellites and operational polar-orbiting satellites. The project has been extended to 2000;

(b) Several major observational programmes are pursued by WCRP: the World Ocean Circulation Experiment (WOCE), the Global Energy and Water Cycle Experiment (GEWEX) and the Arctic Climate System Study (ACSYS). The new Topex/Poiseidon satellite for ocean surface topography, jointly developed and operated by NASA and CNES, and the ESA satellites ERS-1 and, as of 2 April 1995, ERS-2 are of particular importance for WOCE and ACSYS;

(c) Within GEWEX, WCRP produces global monthly fields of precipitation based on a combination of ground-based measurements and remote-sensing data from multiple satellite sources;

(d) Within GEWEX, WCRP has stimulated studies on a rain and cloud radar satellite mission in order to get divergences of energy fluxes in the atmosphere.

217. WMO continues to cooperate closely with UNEP, IOC and ICSU in the development of GOOS and to provide support for GOOS planning and implementation.

218. Climate system monitoring activities within the World Climate Data and Monitoring Programme make use of satellite data for monitoring such parameters as sea level, atmospheric temperature, sea ice, snow cover, solar radiation, aerosol optical depth, albedo and clouds. The WMO World Climate Data Information Referral System (INFOCLIMA) includes information on some available satellite data sets needed for climate monitoring and research. A Climate Change Detection Project has been established under the World Climate Data and Monitoring Programme to advise on the suitability of data, including satellite data, for detecting climate change. The World Climate Applications and Services Programme continues to investigate and promote development of potential uses of satellite data in climate applications.

219. WMO continues to provide valuable data on atmospheric status through GAW, which it established in 1989 as an early warning system to detect changes in the greenhouse gases, including ozone, aerosols and other trace substances in the atmosphere that may lead to global climate change. GAW consists of surface and vertical observations to provide the information required to verify future satellite-based measurements of selected atmospheric constituents. In particular, GAW, through its more than 150 total ozone stations, has furnished critical ground truth data to calibrate ozone observations from space.

220. The WMO Commission for Atmospheric Sciences continues to rely on the use of satellite data for research, for both climate studies and weather analysis and prediction of all time scales. The WMO Programme on Short- and Medium-range Weather Prediction Research and Tropical Meteorological Research will study the application of high-resolution quantitative satellite data.

221. Major WMO global data-processing centres operated by WMO members and equipped with supercomputers and high end mainframe computing facilities rely on remotely sensed data from meteorological satellites for operational input data. This is particularly the case for data acquired over ocean areas and land areas. Data acquired by meteorological satellites are used in global atmospheric and ocean models for numerical weather prediction and environmental quality assessment, as well as climate monitoring and medium-range, long-range, seasonal and multi-seasonal climate prediction.

222. Based on the structure of the WMO Hydrology and Water Resources Programme, a number of projects relating to hydrological networks and instrumentation, hydrological forecasting methods and systems and the application of remote sensing techniques to operational hydrology are undertaken on a continuing basis. The programme is revised every four years by the WMO Commission for Hydrology. The results of the projects formulated by the Commission at its tenth session in 1993 will be available in 1996. A project on the intercomparison of data telemetry and transmission systems is currently being planned for implementation during 1996.

223. WMO and the World Bank are promoting a major long-term initiative to improve knowledge of the hydrological cycle through a World Hydrological Cycle Observing System (WHYCOS). WHYCOS would consist initially of about 1,000 stations worldwide on major rivers. Each station would monitor about 15 variables such as flow, suspended load, water chemistry and on-bank meteorological variables. Many of the stations already exist, mostly in developed countries. The data collected would be transmitted via geostationary satellites to national, regional and global centres, employing, among others, the WMO World Weather Watch system where applicable. In turn, WHYCOS would contribute data to the World Weather Watch system, GCOS and GTOS. The concept is currently being developed for Africa, Latin America and the Caribbean, for countries bordering the Mediterranean Sea and for the Aral Sea basin.

224. WMO continues to make joint efforts with IOC, UNEP and ICSU in implementing various programmes in 1996, 1997 and future years under GCOS, which was established by those organizations to conduct observations that would meet scientific requirements for monitoring the climate and predicting climate changes. The Joint Scientific and Technical Committee and the Joint Planning Office were also established to develop the plans and strategy for the implementation of GCOS. The programmes of GCOS will be implemented in accordance with the initial plan developed by the Joint Scientific and Technical Committee, which outlined the scientific priorities for the programme and proposed a strategy for proceeding, including defining the components of an initial operational system.

225. A space component is considered a key element of the initial operational system. The Joint Scientific and Technical Committee formed a Space-based Observation Panel, which developed and issued in June 1995 a GCOS Space Plan, the initial plan for the space-based observation component. The GCOS Space Plan is aimed at the following: (a) defining the components of the initial operational system, based on the existing systems of various space agencies; (b) outlining the scientific and technical requirements for observations of global, atmospheric, oceanic and terrestrial climate variables that may be made with space instrumentation; and (c) reviewing existing and planned space agency missions for compliance with GCOS requirements, including assured continuity of the observations. Copies of the initial plan for GCOS are available from the Joint Planning Office of GCOS at Geneva or via Internet at the GCOS homepage (htpp://www.wmo.ch/web/gcoshome/html). The Joint Scientific and Technical Committee also issued the Data and Information Management Plan, which outlines strategies for an international data distribution system to be implemented in the period 1996-1998.

3. Dissemination or exchange of information on the status of technology or operational systems through meetings or publications

Dissemination of technological information

226. UNEP is currently involved in the following collaborative undertakings:

(a) Coastal and Marine Environment Management Information System (COMEMIS) for the South China Sea subregion, covering Cambodia, southern China and Viet Nam, a project with the Asian Development Bank and the Government of Sweden;

(b) Information management in the North-West Pacific Action Plan (NOWPAP): directory of coastal and marine experts and institutions; bibliography on coastal and marine environments in the region; and feasibility report on GIS applications in coastal marine environment for NOWPAP.

227. In collaboration with ITC, UNESCO has published a book entitled *Introduction to the Use of GIS for Practical Hydrology*, which will be distributed in 1996 free of charge.

228. UNESCO, within the framework of the International Hydrological Programme and in collaboration with the International Association of Hydrological Sciences, will organize the second international conference on GIS entitled "Application of Hydrology and Water Resources Management" in 1996 at Vienna.

229. WMO issues a biennial report on the status of implementation of the World Weather Watch. The report includes a section on the space-based portion of the Global Observing System, consisting of a network of geostationary and polar-orbiting satellites. The next report will be published in mid-1997. The status of satellite technology for application in meteorological observations and telecommunications is considered at each session of the WMO Commission for Basic Systems, which meets on a biennial basis. The next session of the Commission will take place during the second half of 1996.

230. WMO, in cooperation with IOC, continues to make considerable efforts to develop shipboard facilities which will enable ships at sea to receive meteorological and oceanographic data from Inmarsat and will disseminate warnings and forecasts.

231. The WMO Commission for Marine Meteorology, the joint IOC/WMO Committee for Integrated Global Ocean Services System and the IOC Committee for the International Oceanographic Data and Information Exchange maintain a high level of interest in the use of satellites for both ocean observation and marine communications. A group of experts from the above-mentioned bodies has prepared a consolidated report on polar-orbiting oceanographic satellites and will expand this report in 1996 and beyond to cover geostationary satellites, the management of ocean satellite data and other ocean remote sensing issues.

232. A working group of the WMO Commission for Agricultural Meteorology is presently responsible for reviewing and summarizing the development of techniques and methods to obtain and manage ground-based and remotely sensed agrometeorological and agronomic data in the most timely and efficient manner for application to agriculture. A working group of the Commission prepared a report concerning processing and analysis of remote sensing data, as well as the application of those data to agriculture. The report is being reviewed for publication.

233. The WMO Commission for Aeronautical Meteorology is actively involved in the development and implementation of the ICAO World Area Forecast System (WAFS), which uses satellite-based communication systems to distribute information on aeronautical meteorological forecast in support of aviation. The United States transmits WAFS products to two International Telecommunications Satellite Organization (INTELSAT) satellites and the United Kingdom transmits WAFS products to cover Africa, Europe and West Asia.

D. Basic space science

234. The sixth United Nations/European Space Agency Workshop on Basic Space Science for Developing Countries will be organized in Germany in September 1996.

235. The United Nations Programme on Space Applications will continue to provide assistance to the astronomical observatory in Sri Lanka, which was established in January 1996. A telescope has been donated to the observatory by the Government of Japan as a result of the recommendations made by the United Nations/European Space Agency Workshop on Basic Space Science for Developing Countries, held at Bangalore, India, from 30 April to 3 May 1991 (A/AC.105/489).

236. The United Nations Programme on Space Applications will publish selected manuscripts on basic space science from the activities of the Programme conducted in the period 1996-1997 (see paragraph 113 above).

237. The Office for Outer Space Affairs will prepare a study on basic space science in developing countries.

E. Safety aspects

238. BDT of ITU has a programme from 1994 to 1999 to elaborate master plans for the implementation of GMDSS and the development of maritime radiocommunication services.

239. ITU Radiocommunication Study Group 8 (mobile, radiodetermination, amateur and related satellite services) continues to examine various aspects of satellite uses in GMDSS, including the characteristics of satellite emergency position-indicating radiobeacon (EPIRB) systems, and to identify requirements for mobile-satellite systems to be employed in GMDSS.

240. IMO, in close cooperation with the Radiocommunication Bureau of ITU and the International Hydrographic Bureau of the International Hydrographic Organization, has finalized a study on the use of

electronic chart display and information systems on board ships, including means of updating electronic navigational charts, which will be broadcast through the Inmarsat enhanced group call and SafetyNET systems. Operational performance standards for the Electronic Chart Display and Information System have been approved and are being implemented.

241. The amendments to the 1974 International Convention for the Safety of Life at Sea (SOLAS) that were adopted by the 1988 Conference of Contracting Governments entered into force on 1 February 1992, introducing GMDSS. The system is being introduced in stages and will be fully implemented on 1 February 1999. Satellite communications form a major part of GMDSS, and all SOLAS ships are requested to carry satellite EPIRB systems. IMO also continues to prepare the Master Plan of shore-based facilities for GMDSS and provides technical assistance on this matter to developing countries.

242. The further development of GMDSS to provide for its orderly introduction will be continued by IMO in close cooperation with ITU, WMO, the International Hydrographic Organization, Inmarsat and the International Search and Rescue Satellite System (COSPAS-SARSAT).

243. The Principles Relevant to the Use of Nuclear Power Sources in Outer Space, adopted by the General Assembly in its resolution 47/68 of 14 December 1992, are based on the recommendations of the International Commission on Radiological Protection, and a process of review and revision has been established. The recommendations have been recently revised. In this connection, a joint secretariat of ILO, FAO, WHO, IAEA, the Organisation for Economic Co-operation and Development and the Pan American Health Organization followed the most recent recommendations of the International Commission on Radiological Protection in preparing the new International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, which would be applicable also for sources in outer space. The Standards were approved by the IAEA Board of Governors in September 1994. An interim edition of the Standards was issued (in English only) pending their formal adoption or acknowledgement by the other sponsoring organizations. The other five organizations have since then approved the Standards, and the final edition in six languages is to be issued by early 1996.

244. IAEA has prepared a draft safety practice document entitled *Emergency Planning and Preparedness for Re-entry of Nuclear Powered Satellites*, the purpose of which is to provide a general overview of the management of incidents or emergencies that may arise when control of satellites is lost, and nuclear power sources employed in space systems re-enter the atmosphere and impact on the Earth's surface. The document is expected to be published in 1996.

245. IAEA has published more than 100 documents (standards and guidance) on the safety of reactors in land-based nuclear power plants and also for research reactors in its Safety Series. Many requirements and recommendations in those publications may be applicable to the safety of nuclear power sources in outer space.

F. Other activities in the field of space science and technology and its applications

246. The following international workshops and international or regional conferences are being planned by the United Nations Programme on Space Applications in 1996:

(a) The Second United Nations Regional Conference on Space Technology for Sustainable Development in Africa, to be held in South Africa in October 1996;

(b) A United Nations/Spain International Conference on the Development and Design of Experimental Payloads on Small Satellites, to be held at Madrid in October 1996;

(c) A United Nations/United States International Conference on Spin-off Benefits of Space Technology: Challenges and Opportunities, to be held at Houston, United States, in October-November 1996;

(d) A United Nations/Chile/ESA Workshop on Applications of Space Techniques to Prevent and Combat Disasters, to be held in Chile in 1996.

247. In response to the decision by the General Assembly in its resolution 37/90 to establish an International Space Information Service, the Office for Outer Space Affairs has made progress in developing a limited database capability and to create a homepage on the Internet through which a wide range of information regarding the space-related activities of the United Nations, particularly those of the Committee on the Peaceful Uses of Outer Space and the United Nations Programme on Space Applications, can be accessed. The Office is cooperating with the German Space Agency (DARA) in the preparation of a study on the feasibility of establishing a computer-based international space information service.

248. Selected manuscripts from the activities of the United Nations Programme on Space Applications conducted in 1995 at Graz, Austria, and at Oslo (see paragraph 113 above).

249. The Office for Outer Space Affairs continues to issue the *Monthly Survey of Selected Events in the Peaceful Uses of Outer Space* to provide information on worldwide space activities in various fields. The publication compiles articles selected from a number of periodicals related to space activities.

250. In response to the Working Group of the Whole of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space, the Office for Outer Space Affairs has prepared or will prepare studies with the following titles: "Space applications for sustainable development"; "Developing tele-education programmes through international cooperation"; "Microsatellites and small satellites: current projects and future perspectives for international cooperation"; and "Global exchange of scientific and technical information: networking possibilities for developing countries".

251. ESCAP is organizing a meeting of a regional working group on space science and technology development in connection with an expert group meeting on small satellite data applications in May 1996. This will be followed by a study on small satellite technology development and applications in Asia and the Pacific, to be conducted in 1996.

252. UNIDO continues to make efforts to promote cooperation between developed and developing countries for maximizing the benefits of space technology spin-offs for developing countries. The promotion and the outlines of its programme are explained in issue No. 1 of its new quarterly publication *High Technology Spin-Offs Monitor*, which focuses on this particular subject and technology transfer. UNIDO is currently presenting its programme to the relevant governmental organizations and industry involved in space activities for their consideration.

253. The key features of the UNIDO programme are technology spin-off monitoring, assessment and forecasting, establishment of relevant databases, and development of solutions to specific problems related to the technology transfer process and the funding mechanisms for its elements. The programme also includes assistance to countries in formulating and implementing a national policy and strategy in this area, as well as providing an international framework for the transfer and industrial application of high-technology spin-offs. Besides the publication of a quarterly *Monitor*, three TECHMARTs, business forums for technology transfer and joint venture opportunities focusing on high technology spin-offs and their application in industry, will be organized for this purpose. The problems of industrial applications of high technology spin-offs and commercialization of research and development in this sector will be discussed at the UNIDO regional and international new technology round tables.

254. The International Bureau of WIPO will convene meetings of consultants in 1996 and 1997 to study the desirability and feasibility of adopting rules and/or recommending principles, common to all countries and interested intergovernmental organizations, for the intellectual property protection of inventions and literary and artistic works which were created or are used in outer space.

255. In accordance with General Assembly resolution 49/34 of 9 December 1994, the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space, at its thirty-fourth session, held at Vienna from 27 March to 7 April 1995, considered the question of early review and possible revision of the principles relevant to the use of nuclear power sources in outer space (A/AC.105/607, paras. 24-29), matters relating to the definition and delimitation of outer space and to the character and utilization of the geostationary orbit, including consideration of ways and means to ensure the rational and equitable use of the geostationary orbit without prejudice to the role of the International Telecommunication Union (A/AC.105/607, paras. 30-39 and annex I) and the legal aspects related to the application of the principle that the exploration and utilization of outer space should be carried out for the benefit and in the interests of all States, taking into account the needs of developing countries (A/AC.105/607, paras. 40-45 and annex II). Subject to the decision of the General Assembly, the Legal Subcommittee will continue to consider these questions in 1996.

Notes

[1]*Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992* (United Nations publication, Sales No. E.93.I.8 and corrigenda), vol. I: *Resolutions Adopted by the Conference*, resolution 1, annex II.

[2]See "Report of the World Conference on Natural Disaster Reduction (Yokohama, 23-27 May 1994)" (A/CONF.172/9), chap. I, annex II. The report will subsequently be issued as a sales publication of the United Nations.

[3]*Official Records of the General Assembly, Forty-ninth Session, Supplement No. 14* (A/49/14, para. 188).

[4]United Nations, *Treaty Series*, vol. 144, No. 17949.

[5]Ibid., vol. 740, No. 10612.